ELECTRICAL REVIEW

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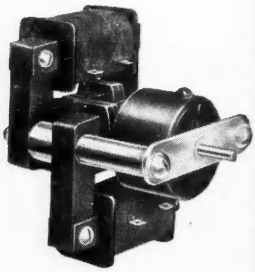

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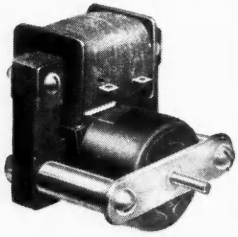

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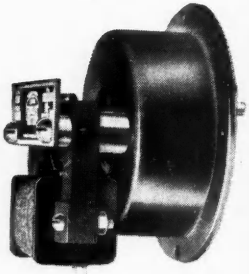

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ELECTRICAL REVIEW

1st AUGUST, 1952

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLI • NO. 3897

Installation Inspection

ALL responsible people in the electrical industry agree that electrical installations must be properly carried out to ensure public safety and satisfaction and to protect the reputation of the industry itself. It is realized that supervision is entailed but the nature of that supervision is a matter of debate. The first step is some form of registration of electrical contractors, and perhaps their operatives as well, but opinion is divided between voluntary and compulsory methods. Already voluntary registration has been tried (in the form of the National Register of Electrical Installation Contractors) but because of lack of support, moral and financial, it has not been sufficiently successful. Distaste for mandatory methods here has prevented the idea of compulsory registration getting very far, although its advocates are apparently still hopeful of a change of attitude on the part of those who oppose it.

The suggestion that a National Inspection Council should be set up presents a compromise which might achieve a great deal of what both parties aim at. In essence such a Council would have to be very similar to the National Register for it would need to have a system of certification of standing and competence of contractors, with the power of withdrawing recognition from those who failed to maintain the necessary standards of workmanship. But with the backing of the powerful electricity supply interests and the established electrical contractors it could wield such an influence that no practitioners of the installation craft could afford to ignore it. The Council could do what the National Register, through lack of funds, was unable to do: institute an adequate inspection system and make the public aware of the difference between good and bad installation work.

An Organizing Committee under the chairmanship of Mr. P. V. Hunter was set up in 1949 and last year it circulated to the bodies represented a final draft report containing proposals for the setting up and operation of a National Inspection Council. This report

now awaits the observations of the Electrical Contractors' Association, whose president said at the recent annual conference that the E.C.A. Council still had the matter under consideration. The E.C.A. is anxious to be sure from the start that the Council's operations, which will involve considerable expenditure, will be justified by the results. It is not easy to guarantee this in advance but the other organizations concerned seem to be satisfied that the scheme will work. The public could not secure the full benefit of the scheme without the E.C.A.'s co-operation. May we hope that it will be forthcoming?

THE WIRING REGULATIONS

It is a tribute to the work of the I.E.E. Wiring Regulations Committee that so few of the requests for interpretations of requirements are of general interest. From the selection of replies given in this issue it appears that in most cases the Regulations would have been self-explanatory if fuller use had been made of the index in co-ordinating various aspects, or if there had been more complete knowledge of associated British Standards. Nevertheless, since safety is involved, the inquirers have been wise to make doubly sure if they harboured doubts in particular instances.

INSTALLATION ECONOMY

The need for economizing in materials has led to a study of means by which works carried out by the Service and Government Departments can be simplified and the results appear in a report reviewed in this issue. It is thought by Mr. Hugh Molson, Parliamentary Secretary, Ministry of Works, that the recommendations made are of wider application. This may be the case but they should be applied with care and discrimination. It is proposed that the I.E.E. should be asked to promulgate increased ratings for v.i.r. cables, reverting to a wartime relaxation, as an interim measure. That no provision should be made for "unknown" future loads violates one of the canons of electricity supply and is patently undesirable in the ordinary domestic installation where the consumer often proceeds from lighting and radio to other electrical applications.

COMMISSIONING TROUBLES

To secure the greatest fuel saving, steam is raised to temperatures that may equal twice the difference between the temperature of the atmosphere and that of outer space. There are thus inevitably steep temperature gradients and hence varying rates of expansion between associated metal components of generating plant, which is accentuated by differences in their mass, as in the stator and rotor of steam turbines. This accounts for some of the more serious "teething" troubles that have been experienced in the commissioning of new plant. Fortunately, any such delays are only a small fraction of those that arise from other causes not subject in the same way to physical laws.

THE BASIC REASON

Electric heating for various reasons has not hitherto made the headway in the U.S.A. that it has in Europe. The annual sale of electric heaters in Norway, the *Electrical World* states, is enough to absorb the planned annual addition to generating capacity, but there as in Great Britain fuel shortage and other special circumstances have favoured its growth. The main reason, however, is given by our contemporary as the increasing appreciation by the public of the advantages of convenience, cleanliness, safety, ease of control and absence of bother—advantages which will extend electric house heating in the United States much faster than is generally expected.

Electricity in South Africa

1.—History and Development of Public Supply

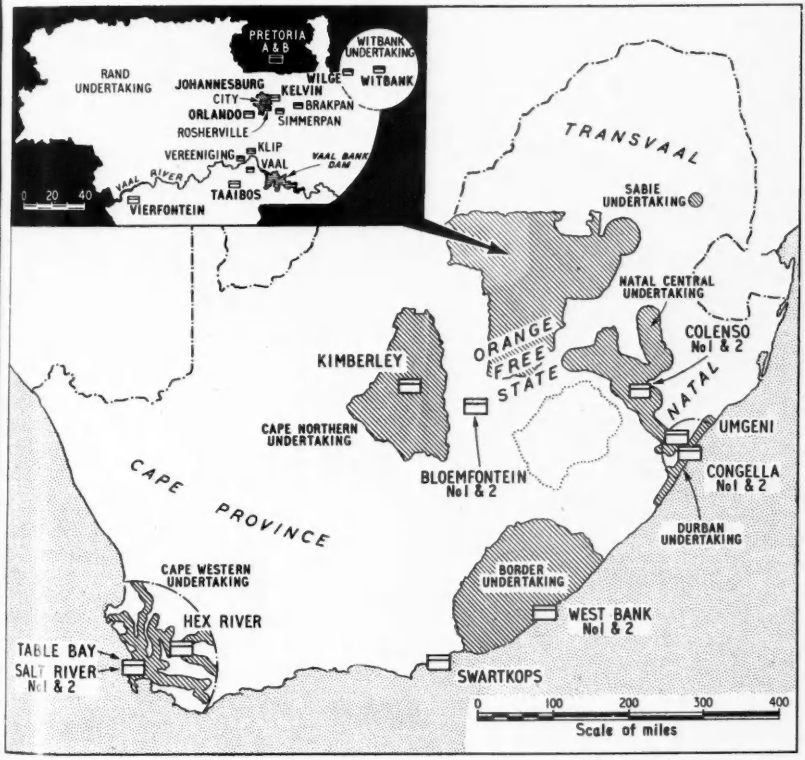
By HAROLD J. BEARD, B.A., M.I.E.E.*

PUBLIC electricity supply within the Union of South Africa is now almost entirely in the hands of the Electricity Supply Commission and the municipalities, the only large privately owned undertaking, that of the Victoria Falls and Transvaal Power Co., having been purchased by the Commission in 1948.

Practically all the large municipal undertakings co-operate to varying extents with one or other of the Commission's seven undertakings. Of the 26 municipalities selling over ten million kWh per annum, Durban and sixteen others purchase all the power they require in bulk from the

*Messrs. Merz & McLellan, consulting engineers.

Power stations within the Union of South Africa with (inset) main power station sites of the Rand undertaking of the Electricity Supply Commission



Commission and carry out their own distribution. The Cape Town Corporation has a "pooling agreement" with the Commission's Cape Western undertaking which provides for the joint operation of the generating plant of both bodies. At Johannesburg the system peak loads of the Corporation and the Commission's Rand undertaking occur at different times of the day and peak load supplies are interchanged. The Pretoria Corporation also has an arrangement with the Commission for reciprocal supplies. Port Elizabeth has its own generating station, but will take a bulk supply from the station which the Commission is building at Swartkops. Due to its geographical position Bloemfontein is the only large municipality which is not interconnected with one of the Commission's undertakings.

Public Control

Under the Electricity Act, 1922, an Electricity Control Board was set up for the purpose of regulating the supply of electricity, which may be provided only by undertakings under licence issued by the Board, except in the case of the following:—

(*a*) Government Departments or the Railway Administration.

(*b*) Urban local authorities within their municipal boundaries; a licence must, however, be obtained for supplying electricity outside a municipal boundary. With this exception and the obligations to comply with the regulations in force and to furnish such returns as may be required, urban local authorities are not responsible to the Control Board. They are, however, subject to the independent judicial authority of the Administrator of the Province whose authority is required for the extension of municipal undertakings, including the placing of contracts for plant and equipment.

(*c*) Undertakings whose plant capacity is less than 500 kW.

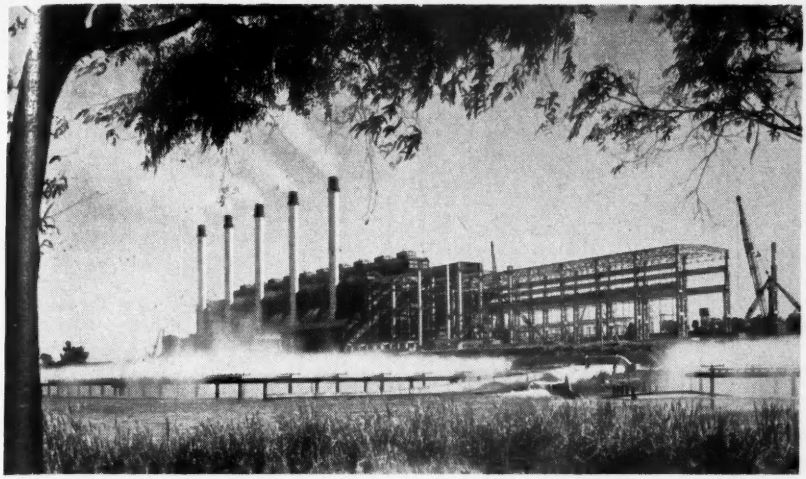
(*d*) Concerns generating power for their own use, provided not more than one million kWh a year is supplied to outside consumers.

The Electricity Act, 1922, also authorized the formation of an Electricity Supply Commission whose duties were to establish, acquire, maintain and operate undertakings for the efficient supply of electricity to Government Departments, the Railway Administration, local authorities, companies and other persons carrying on industrial undertakings, or to any persons whatsoever in the Union; also to investigate new or additional facilities for supply in any area, the co-ordination of existing undertakings, and to stimulate the provision, wherever required, of a cheap and abundant supply of electricity.

The Commission must obtain separate licences from the Control Board for each of its undertakings. The Control Board may, at its discretion, prescribe in the licence the maximum quantity of electricity which may be generated and the maximum generating capacity of the plant which may be installed at any particular generating station, or within any particular area.

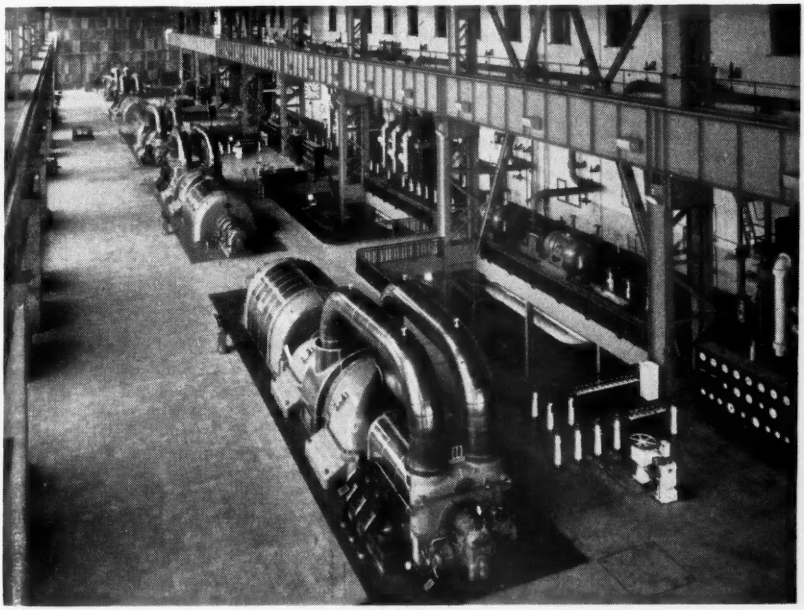
Each licence issued by the Control Board contains a schedule of standard prices which the licensee must apply to the various classes of consumer. Reduced prices may be charged, with the Control Board's consent, to take into account special features of the supply: such as amount consumed, uniformity and time of demand, expenditure involved in giving the supply, and special circumstances. After seven years from the date of the licence and thereafter at stated intervals, being not less than three years, the Control Board has to revise the standard schedule. It is provided that at each revision not more than one-half of the reduction, if any, effected in the cost of generation and distribution shall be applied to the reduction of the schedule of prices and, in addition, 25 per cent of the surplus profit for each year shall be paid to the consumers. The prices charged by the Commission for electricity supplied must be in accordance with the schedule of standard prices contained in the licence, provided that its charges are adjusted from time to time so that its undertakings are carried on neither at a profit nor at a loss.

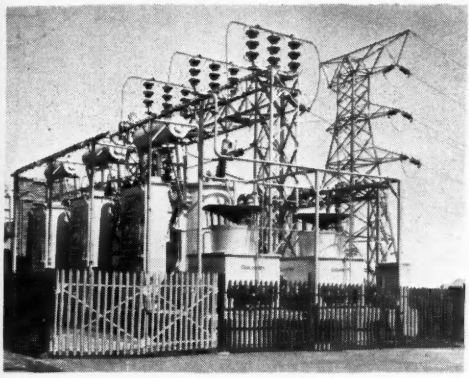
The undertakings of urban local authorities are not liable to compulsory purchase at any time, but all licensed undertakings, other than those of the Commission, are subject to expropriation and transfer to the Commission after the licence has been in force for forty years. Before an urban authority can establish an undertaking, or extend the plant capacity by more than 10 per cent, the approval of the Administrator of the Province must be obtained. The four Provinces are Cape, Transvaal, Orange Free State and Natal. The Administrator is required to refer an



Orlando power station as at April, 1952; spray cooling pond in foreground

Interior of Orlando power station showing five completed turbo-generators





Clevend substation, 88 kV terminal from Orlando; note coolers in right foreground

application to the Commission for a report whether the proposed extension conflicts with any of the Commission's schemes and whether it would be preferable in the public interest for the authority to purchase power in bulk from the Commission.

It is of special interest to note that the Electricity Supply Commission was set up as a public board, not as a government department, so that it might be as free as possible from political influence while at the same time combining the advantages

Natal, South Coast, 88 kV power line near Umkomaas

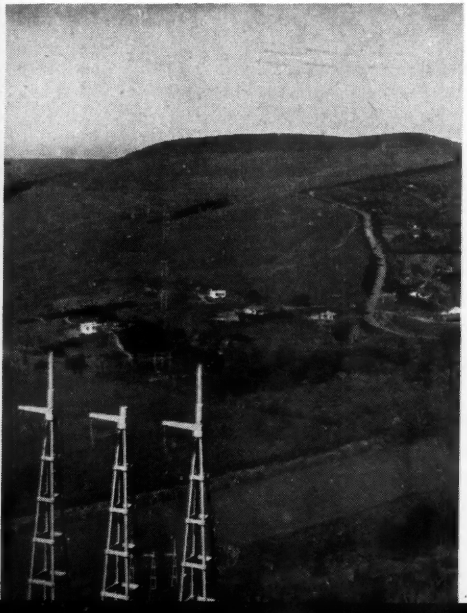


TABLE I.—Installed and Projected Capacity

Undertakings	Plant installed at 31st Dec., 1951	Additional plant under construction, on order, or authorized at 31st Dec., 1951
	MW	MW
E.S. Commission		
Rand and Witbank ..	1,050*	816†
Durban and Natal Central	320	85†
Cape Western ..	92	120†
Cape Northern ..	20	11
Border	37	30
Swartkops	—	40
Sabie	1(H)	—
Municipalities		
Johannesburg ..	277	240
Pretoria	94	90
Cape Town	229	—
Port Elizabeth ..	59	—
Bloemfontein	24	28
Other municipalities	40	Not known
	15(O)	Not known
	2(H)	Not known
Total	2,260	1,460

(O) Oil fired; (H) hydro; remainder coal fired.
* Excludes 42 MW of steam-driven air compressors.
† Since 1st January, 1952, the Commission has authorized, or has under consideration, additional extensions amounting to about 400 MW for its undertakings.

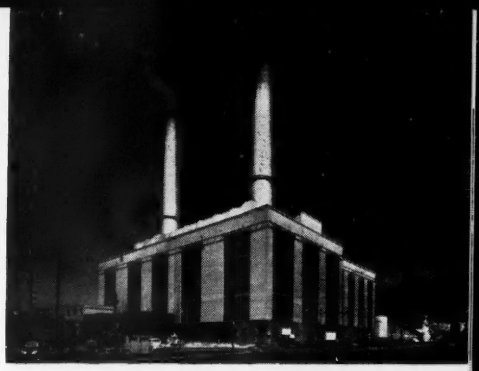
of public ownership with those of private enterprise. Thus the Commission is in law a body corporate, just as is any company, and has no privileges other than those which were given to it by the Electricity Act of 1922.

Generating Capacity

The existing generating plant capacity of the public supply undertakings amounts to a total of 2,260 MW, of which 740 MW is owned by the municipal undertakings and 1,520 MW by the Electricity Supply Commission. The generating plant already installed and additional plant projected is given in Table 1.

Generation is virtually entirely a.c., only about 3 MW of plant generating d.c. The Table 1 figures for additional plant under construction, on order, or authorized at 31st December, 1951, include the new power stations shown in Table 2.

In spite of the vast spaces in South Africa the siting of power stations presents many problems. The most difficult is that of cooling water supplies because flow in all the rivers, except the Vaal, varies appreciably from summer to winter due to the seasonal rainfall. On this account all the new power stations situated inland will have water cooling towers. Swartkops, Salt River No. 2 and West Bank No. 2 are sited on the coast and will use



View of Table Bay power station from the dock end with Devil's Peak in the background

sea water for directly cooling the steam condensers.

The Vierfontein, Taaibos and Wilge stations are sited adjacent to collieries so that the coal can be conveyed directly from the pithead to the power station. This follows the present arrangement at the Vaal and Klip stations of the Commission.

As mentioned later, some power plant can now be made in South Africa, but the majority has to be imported and is mainly manufactured in Great Britain.

Transmission and Distribution

The different transmission voltages employed and the relative lengths of transmission lines and underground mains are shown in Table 3, the lengths being given in route or line miles.

Table 4 shows the route miles of high voltage transmission lines which are under construction.

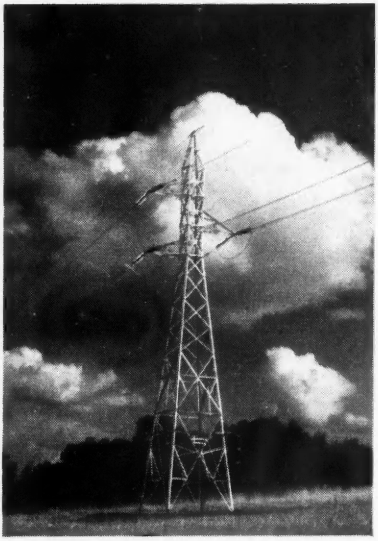
TABLE 2.—New Power Stations

Undertakings	T.S.V. steam conditions lb/sq in and deg F	Turbo-alternators MW	Boiler plant k lb/hr	Estimated commissioning date of first section of plant
E.S. Commission				
Hex River ..	600/800	3 × 20	4 × 200*	1952
Vierfontein ..	600/825	7 × 30	12 × 210	1953
Umgeni	600/850	2 × 30	4 × 180	1953
Swartkops ..	600/825	2 × 20	2 × 210	1953
Wilge	600/850	2 × 30 1 × 60	4 × 150 2 × 400†	1953
Taaibos	600/825	6 × 60	6 × 580†	1954
Salt River No. 2	600/900	2 × 30	4 × 260	1954
West Bank No. 2	400/800	2 × 15	2 × 175	1954
Pretoria				
Pretoria "B" ..	625/825	3 × 30	6 × 210	1952
Johannesburg				
Kelvin	600/850	3 × 30	6 × 187·5	1957
Bloemfontein				
Station No. 2 ..	400/800	2 × 10	3 × 110	1955

* Spreader stokers. † Pulverized fuel firing. Remainder will be stoker fired

TABLE 3.—Transmission Lines

Undertakings	132 kV transmission	88 kV (A) or 66 kV (B) transmission	40 kV (C); 33 kV (D) or 22 kV, 21 kV and 20 kV (E)		H.v. distribution 12 kV to 2 kV incl.		Low voltage distribution	
			Transmission lines	Cables	Overhead Mains	Cables	Overhead Mains	Cables
	miles	miles	miles	miles	miles	miles	miles	miles
E.S.C. (at 31st Dec., 1951)								
Rand and Witbank..	64	1,658(A)	698(C) 361(E)	106(E)	364	167	245	12
Durban and Natal Central	—	674(A)	111(D) 72(E)	2(D)	771	11	244	4
Cape Western ..	—	141(B)	344(D)	60(D)	706	49	366	10
Border	—	—	—	—	19	14	42	—
Municipalities								
Johannesburg (at 30th June, 1951) ..	—	36(A)	—	95(E)	—	536	743	216
Pretoria (at 30th June, 1951) ..	—	—	17(C) 23(D)	33(D)	180	513	749	184
Capetown (at 31st Dec., 1951) ..	—	—	—	91(D)	76	361	896	247
Durban (at 31st July, 1951)	—	—	19(D)	75(D)	221	618	650	424
Other municipalities (approx.)	—	—	1(D) 25(E)	—	900	1,200	3,900	600
	64	2,505	1,671	462	3,237	3,469	7,835	1,717



Natal Central 132 kV Durban–Colenso interconnector line

In the case of the Rand undertaking the transmission line extensions are mainly associated with the new Vierfontein and Taaibos stations and the general development of the Orange Free State goldfields. These lines are being designed and erected by the Commission's staff.

TABLE 4.—Line Mileage Under Construction

Undertakings	132 kV	88 kV
	miles	miles
E.S.C. (at 31st Dec., 1951)		
Rand and Witbank	200	53
Durban and Natal Central ..	122	46
Municipalities		
Johannesburg (at 30th June, 1951)	—	59

Distribution is by both overhead and underground mains. Government Notice No. 425 dated 9th March, 1926, laid down that the standard " pressure " at consumers' terminals should be 380/220 V at 50 c/s for 3-phase systems, or 440/220 V for d.c. systems. There still remain, however, a few large and small undertakings distributing a.c. at other voltages between 433/250 V and 347/200 V.

Growth of Load

The growth of the demand for electricity in the Union just before and following the last war has been:—

Year	Total kWh consumed millions
1938–39	5,452
1946–47	7,494
1947–48	8,089
1948–49	8,829

The figures for 1948–49 can be split up into:—

Commission	6,222
Local authorities and municipalities ..	1,805
Private generation	802
Total	8,829

Klip power station in the Transvaal burning coal conveyed directly from an adjacent colliery

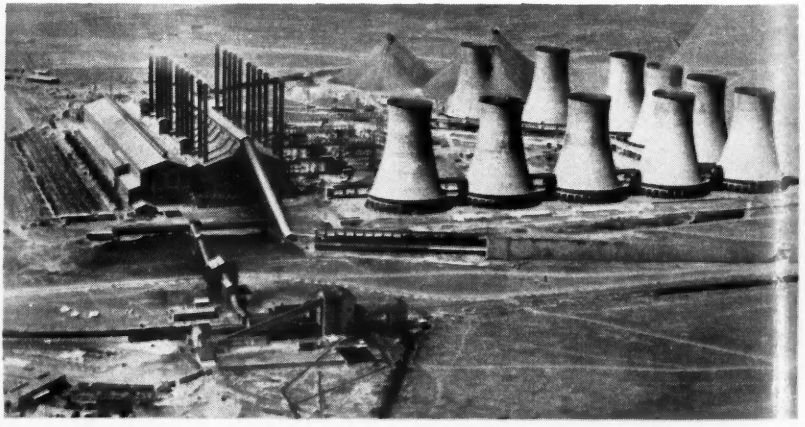


TABLE 5.—ENERGY SOLD

	1951 year ending	Traction	Mining	Industrial	Domestic and lighting	Bulk supplies to other municipalities	Total
		Million kWh	Million kWh	Million kWh	Million kWh	Million kWh	Million kWh
E.S.C.	31st Dec.	539	4,105†	1,150†	134	722*	6,650
Johannesburg	30th June	32	—	247	410	—	689
Cape Town	31st Dec.	15	—	140	392	—	545
Durban	31st July	7	—	197	273	—	477
Pretoria	30th June	20	—	208	149	10	387
Port Elizabeth	31st Dec.	—	—	91	80	42	213
	Total	611	4,105	2,033	1,438	774	8,961

* Excludes the bulk supply to Durban Corporation; also excludes reciprocal supplies between the Commission and the Corporations of Johannesburg, Cape Town and Pretoria.

† Excludes bulk supplies of compressed air and steam supplied by the Rand undertaking, which amounted to 250 million and 18 million equivalent kWh respectively in 1951.

The increase is most marked in the area of the Commission's Rand undertaking where the industrial supplies and the bulk supplies to the reef towns (excluding the mining load) which amounted to 1,271 million kWh in 1951, has increased by 47 per cent between 1949 and 1951. An analysis of the statistics of the Electricity Supply Commission and the municipal undertakings of Johannesburg, Cape Town, Durban, Pretoria and Port Elizabeth, which together generate about 98 per cent of the public supply, shows that the kWh sold for various purposes approximate as given in Table 5.

Tariffs

A general comparison of the cost of electricity in South Africa and Great Britain (Table 6) will indicate the revenue received per kWh sold and also the average cost of coal delivered to the power stations.

TABLE 6.—Coal Cost and Revenue

	1951 year ending	Delivered cost of coal per short ton (2,000 lb)	Average revenue per kWh sold
		s d	d
SOUTH AFRICA			
E.S.C.			
Rand and Witbank ..	31st Dec.	6 11	0·294
Natal Central..	31st Dec.	14 3	0·531
Cape Western..	31st Dec.	33 10	0·850
Municipalities			
Johannesburg..	30th June	12 7	0·757
Cape Town ..	31st Dec.	34 0	0·863
Durban ..	31st July	19 5	0·817
Pretoria ..	30th June	13 3	0·747
Port Elizabeth	31st Dec.	34 0	0·999
GREAT BRITAIN			
Southern Electricity Board	31st Mar.	56 3* (highest area)	1·47
South Wales Electricity Board	31st Mar.	38 5* (lowest area)	0·92

* These charges include coal and ash handling charges at the power stations.

STREET LIGHTING NOTES

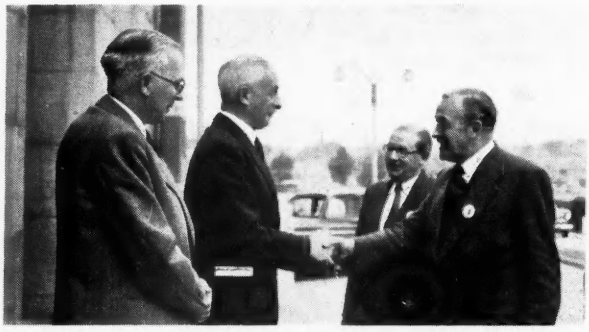
OWING to the increase in the cost of gas, electrification of all existing gas lamps in the district is to be recommended to the WELLINGTON (Salop) Urban District Council by its General Purposes Committee, subject to the approval of the Ministry of Transport. The Committee is also recommending that a tender of £2,669 be accepted for the installation of modern Class A lighting on the Holyhead Road and that street lighting should be undertaken throughout the year instead of from 15th August to 15th May as at present.

The extension of electric street lighting from STOURBRIDGE, along the main Birmingham road to Lye, has been approved by the Ministry of Transport.

New sodium type lamps will light the main street of REDDITCH from Evesham Street to Crabbs Cross, if the Council accepts its Public Works Committee's £9,000 lighting scheme at their next meeting.

The borough engineer of DARLINGTON is preparing schemes for improving the street lighting in Haughton Road and North Road, Darlington. In both cases it is proposed to install sodium lamps.

SOUTHPORT Corporation Lighting Committee has received the consent of the Ministry of Housing and Local Government to the borrowing of the sum of £13,050 for improved street lighting.



Mr. L. J. Davies (director of research and education, B.T.H. Co.) with Mr. E. H. Ball (managing director) greeting Sir John Hacking, accompanied by Mr. W. K. Brasher, on arrival

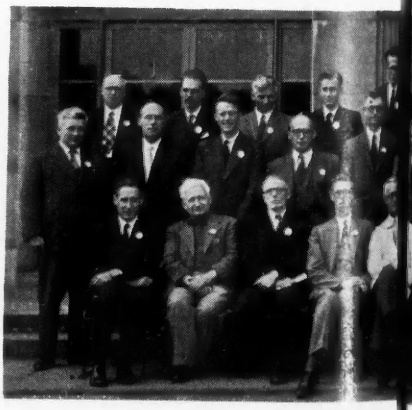
Training for Industry

B.T.H. Summer School at Rugby

CONSIDERING the need of industry to be assured of a regular and sufficient intake of adequately trained young engineers, it was not inappropriate that technical education and technological instruction should be the dominant theme of the second summer school in electrical engineering to be conducted (14th to 18th July) by the British Thomson-Houston Co., Ltd., at its works at Rugby in the last four years.

Distinguished professors from universities in many parts of the country, heads of the engineering departments of technical colleges, Ministry of Education representatives and prominent personalities in the electricity supply industry accepted invitations to attend this six-day " course " which was managed as informally as possible and included tours of the company's laboratories and various workshops. Mr. E. H. Ball, managing director, when welcoming the participants, appealed to teachers to impress upon students the importance of keeping in mind the cost factor in engineering considerations. Sir John Hacking, president, Institution of Electrical Engineers, next addressed the opening session. He observed that only one of the twenty-one lectures they were to hear would deal with the study of electrical engineering. He might therefore be forgiven for speaking about technological training and technical education generally, in which the I.E.E. had a very great interest; indeed, as the guardian of the standards of the profession, it had a very great responsibility.

The I.E.E. Council, particularly its Education and Training Committee, was watching closely two important educational developments, perhaps not yet out of the experimental stage, which had been made possible by close collaboration of the B.T.H. Co. with the Rugby College of Technology and Arts : namely, courses for student apprentices reading for the London



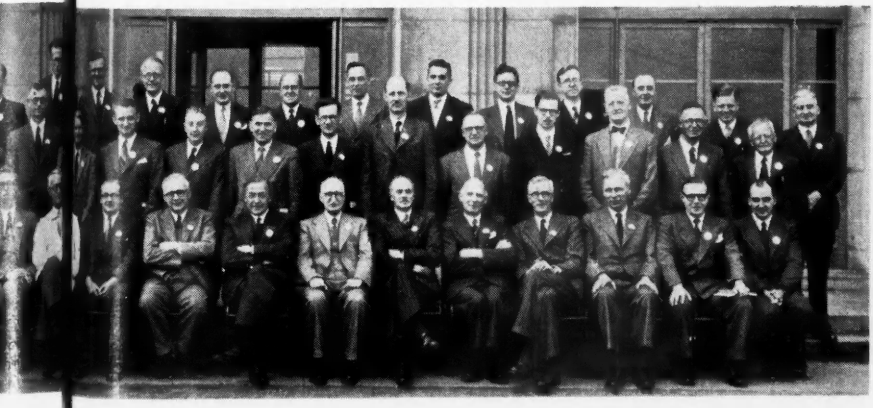
external degree and also advanced courses for graduates. Both had recently been discussed in the theatre of the I.E.E. so he needed only to add that the student or engineering apprentice course was a valuable alternative to the sandwich course advocated by the I.E.E. Education and Training Committee.

Sir John outlined briefly the views of the I.E.E. Council on the broad pattern of the future provision of higher technological education in this country, particularly that of electrical engineering education, being convinced that more effective and wider facilities should be developed rapidly as it would have a profound influence on the level of productivity in the United Kingdom.

Sir John spoke next from the viewpoint of the electricity supply industry. The relations of the industry with the training establishments were of the closest and he gratefully acknowledged the cordial understanding which existed between them. The most important electrical development on which they were now engaged was the 275 kV grid; it would both call forth and do full justice to the talents of the research engineers and plant designers of the electrical manufacturing industry. Another project was the possible cross-channel power cable. A Joint Committee of the British Electricity Authority and Electricité de France had provisionally recommended a 132 kV connection with a capacity of 100 MW comprising four single-core cables, one being spare. One reason why a higher voltage and greater capacity were not proposed was that the existing transmission system in the northern part of France was not strong enough to deal with a heavy cross-channel power transfer, which would entail an expensive 220 kV reinforcement from a point near Paris. From the standpoint of both countries, a 132 kV connection was the most economic proposition, but they had it in mind that the capacity of the connection could be quadrupled by changing over to d.c. transmission in, say, 10 years' time. The decision whether to install this cable would not, however, be made until certain research and development work had been carried out in about 18 months.

We could feel well satisfied with the present state of British technical ability in electrical power engineering, and that we owed in large measure to our methods of training and to the qualities of our teachers. Few members of the electrical profession had any doubts as to the continued growth of use of electricity for all purposes for a long time to come. It was unfortunate

Front row (*left to right*): Prof. J. M. Meek, Prof. B. Hague, Mr. W. Cooper, Prof. J. C. Prescott, Prof. E. B. Moullin, Mr. W. K. Brasher, Mr. L. J. Davies, Sir John Hacking, Mr. H. Jack, Prof. Willis Jackson, Prof. H. E. M. Barlow, Prof. A. Tustin, Prof. G. W. Carter, Mr. H. W. Date, Mr. W. A. Turner. **Middle row :** Mr. G. S. C. Lucas, Mr. D. F. Welch, Mr. W. E. J. Farvis, Dr. H. Tropper, Mr. C. W. Oatley, Mr. J. G. Fleming, Mr. H. W. French, Prof. E. Bradshaw, Dr. P. F. Soper, Prof. E. Brailsford, Dr. J. F. Gillies, Dr. W. J. Gibbs, Mr. J. C. West, Col. H. M. Clarke, Dr. E. Wilkinson, Mr. T. Wadsworth. **Back row :** Mr. C. Grad, Prof. F. M. Bruce, Dr. K. J. R. Wilkinson, Mr. A. R. Pollard, Mr. D. B. Willson, Mr. B. Adkins, Mr. A. Draper, Mr. V. P. Mendoza, Mr. S. G. Rattee, Mr. R. T. Coe, Mr. W. H. Taylor, Mr. M. W. Humphrey Davis, Mr. T. McGreevy, Mr. G. W. P. Page, Mr. R. L. Russell, Mr. J. E. Langley



that one heard to-day so many voices advocating artificial restriction of the use of electricity for other than industrial purposes. It was to be hoped that no steps would be taken to curb the natural trend of electrification which was believed to be so essential to continuing prosperity. Those were no idle fears, however, as the rate of new plant construction which the Government was proposing to permit in the years 1956 and 1957 was well below what was required to meet the average rate of increase of demand and was also below the capacity of the manufacturers.

Mr. L. J. Davies, director of research and education, B.T.H. Co., as chairman of the first session introduced the general course to be traversed during the week. He was followed by Dr. K. J. R. Wilkinson, chief assistant, research laboratory, who made a plea for a more physical approach to the study of electrical engineering. The young engineer, before he took up his career, should be encouraged to think in a logical, as distinct from a technological, manner; his instruction in the techniques of engineering could safely be left to his later training in industry and to his own receptive interest in engineering things.

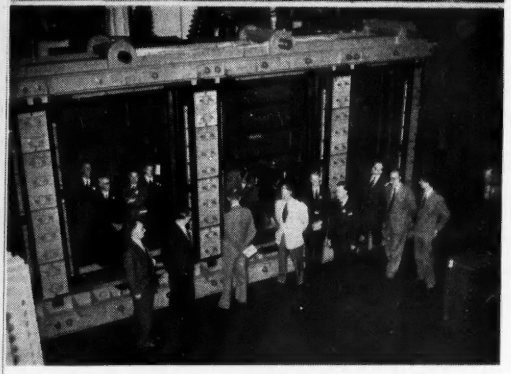
But before developing his theme the lecturer considered what was expected of the graduate electrical engineer when he chose a career in industry. Of the many hundred graduates now in Rugby very few had occupations which were similar in the sense that engineers could be readily exchanged. The manufacturing industry expected engineering graduates to become men of ability in one or other of four broadly defined fields: the first was the commercial field, needing an acuteness of perception of market requirements, of the user's point of view and practice, and of what constituted a company's prestige, all based on a good technical understanding of the product and of the industry in which that product was used.

Secondly, in manufacturing, where interests included a wide range of machine tools, constructional methods, processes, inspection and testing, combined with an understanding of those human problems which could arise on the floor of the shop. Thirdly, in the design department, where engineering knowledge must be thoroughly based, since the whole responsibility for the technical performance and reliability of the manufactured apparatus must rest there.

Fourthly, in research and development, where outlook transcended established practice, and originality, intelligence, resourcefulness and patient perseverance enabled work to proceed in directions so far unmapped in textbooks.

After expanding on the subject in detail Dr. Wilkinson concluded that the graduate engineer when he left college should be encouraged to consider the more philosophical aspects of electromagnetism. Their experience at Rugby was that it was far

In the heavy plant factory: the stator under construction in the foreground is for a large motor-convertor. At the back are two half-stators for hydro-electric alternators for the Owen Falls hydro-electric project; six of these machines, each 16,700 kVA at 150 r.p.m., are on order from the B.T.H. Co.



The core of one of the 120 MVA 275/132 kV, three-phase, 50 c/s auto-transformers under construction for the B.E.A. in the large transformer factory

more important in higher engineering education that the teaching accent should stress fundamentals.

Mr D. F. Welch (Aero and Auto Engineering Dept.) explained that when the B.T.H. Co. secured the contract for supplying the electrical equipment for the Saunders Roe "Princess" class of flying boat (see *Electrical Review*, 28th December, 1951) it also accepted a formidable development programme, particularly in respect of the development of d.c. heavy current circuit breakers and contactors. The results had, however, justified the intensive effort and labour involved.

Mr. W. Spence (Industrial Engineering Dept.) indicated modern trends in industrial control with reference to continuous processing. Some of the factors which affected the design of control apparatus were indicated and modern examples described, including closed loop control systems.

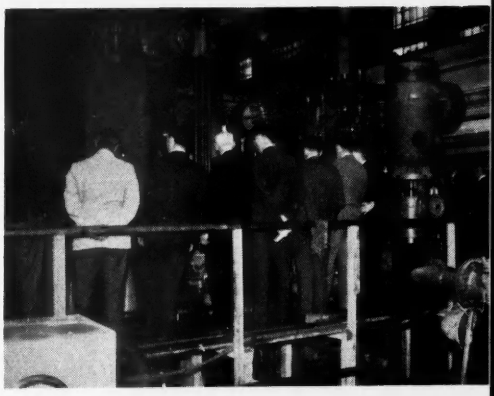
Mr. J. McTaggart (Industrial Engineering Dept.) spoke about the inherent characteristics of some types of voltage regulators and the manner in which they affected the control of power systems. He explained methods of modifying the characteristics to obtain the desired control of system voltage and VAr.

Mr. F. D. Gunton (Industrial Engineering Dept.) considered the control of a.c. arc furnaces by supply circuit elements, the automatic positioning control of electrodes, special features of switchgear and protective schemes for furnaces of this kind.

The task allotted to Mr. W. S. Melville (Electronic Engineering Dept.) was to describe modern dielectric and magnetic materials and the principles upon which they operated when used in the newer electric circuits, including pulsators and other components which employed dielectric and magnetic materials whose properties were characterized by "rectangular" hysteresis loops.

Mr. D. C. Thomas (Electronic Engineering Dept.) described why radar investigations often necessitated the development of measuring equipment, such as electromechanical plotters. Instruments had recently been designed to measure voltages with a meter consuming only 10^{-13} A for the accurate determination of time intervals and allied requirements.

Mr. J. H. Nicoll (Electronic Engineering Dept.) dealt with the parallel operation of



A group in the turbine factory inspecting a 25 MW double-extraction hydrogen-cooled turbo-alternator for the Ford Motor Co. of Canada, Ltd., on the test-bed

centimetric oscillators, such as klystrons and magnetrons, which could be coupled to operate at the same frequency. Their outputs could be employed separately or combined as a single output, which facility had been used to extend the maximum power available from existing valves.

Dr. L. R. Blake (Research Laboratory) pointed out that some 400 papers had been written since the war on the theory and practice of ferromagnetism. He summarized a few of them which had captured his imagination in order to indicate some excellent experimental work which had recently been performed in connection with the domain theory, while nuclear magnetic resonance was a striking post-war discovery which ought not to be omitted. His summary of present information about the eddy current anomaly was not out of place since it was of importance to electrical engineers who must frequently be disturbed by their inability to predict iron losses.

Dr. R. Dunsmuir (Research Laboratory) dealt with the structure, mode of operation and performance of modern high power pulsed magnetrons, indicating that the upper limit of power output was set by a number of factors, some of which were fundamental while others depended upon the materials used. He described phenomena which were as yet imperfectly understood, the clarification of which would probably enable greater power to be obtained from these devices.

Mr. J. A. S. Hilditch (Research Laboratory) indicated how conservation of factory floor space had been taken into account when designing the B.T.H. 2 MV impulse generator and uniform field potential divider. A number of problems had been solved when developing generator charging and tripping circuits as well as in the provision of a large diameter uniform field electrode system (evolved from the Stephenson shape) for use as a capacitance standard in the measurement of generator output voltage.

Mr. D. Edmundson (Test Engineer) was concerned with some manufacturing processes peculiar to electrical products. He stressed the interdependence of new technical development and the parallel developments in manufacturing methods which made the former possible.

The factors which governed the transient reactance of water wheel alternators were discussed by Mr. P. G. Ross (Plant Engineering Dept.) with respect to their effects on the design and cost of a machine when values less than the natural one were required.

Mr. D. J. Pitstow (Motor Engineering Dept.) surveyed problems encountered when designing a.c. rotating machines for aircraft. He considered in detail individual design features and the limitations of salient-pole, cascade, inductor alternators and of small 400 c/s motors.

Mr. K. F. Raby (Plant Engineering Dept.) drew attention to some unusual eddy current problems in a.c. machines. He explained how this loss in large machines could be predetermined by the solution of field problems related to actual conditions.

Mr. L. C. Ludbrook (Electronic Engineering Dept.) dealt with the transient response of solid-yoke laminated-pole d.c. generators. Eddy current damping effects in practice were far less severe than predicted by existing theories. This discrepancy had been investigated and the lecturer discussed the results obtained.

Mr. D. McDonald (Transformer Engineering Dept.) outlined the development, design and construction of transformer windings for from 275–400 kV with special reference to their impulse strength. Analysis of the disc and layer types of windings indicated that the performance of the latter was fundamentally superior to that of the former in this respect.

Mr. D. R. Smith (Rectifier Engineering Dept.) compared the principles of design and operation of conventional rectifiers with those of the type which employed mechanically operated switches driven by a synchronized motor, which type was able to deliver about 10,000 A at 800 V from a single unit.

Mr. K. M. Jones (Power System Engineering Dept.) dealt with aids to design based on load development and the location of potential power, including model representation of the system and the use of computers.

Mr. J. D. Harmer (Research Laboratory) described some recent methods which had been used to measure 50 c/s losses in dielectric surrounding the high voltage winding of a 132 kV transformer; ferromagnetic losses in a single strip specimen excited into the non-linear region with sinusoidal flux density at 50 c/s; and variations of inductor alternator air-gap permeance by the use of an electrolytic analogue.

Mr. R. Snadow (Research Laboratory) dealt with polyester resins for use as electrical insulation. Modifications of these liquid resins could be prepared which, with appropriate techniques, made them suitable for the complete filling of coils; for casting insulation around conductors; encasing groups of components and for laminating.

On the Thursday afternoon there was a discussion at Coton House (apprentice residence) under the chairmanship of Mr. L. J. Davies on aspects of education and training of mutual interest to the universities and industry. Mr. C. Grad (manager, Education Dept.) and Mr. C. W. Oatley (Cambridge University) stressed the desirability of arousing interest in science and engineering in public schools and the grammar schools. Mr. G. S. C. Lucas (assistant chief electrical engineer, B.T.H.) and Prof. M. G. Say (Heriot-Watt College, Edinburgh) dealt with the question whether graduate apprenticeship was necessary. Dr. W. J. Gibbs (consultant, Plant Engineering Dept., B.T.H.) explained the B.T.H. Engineering Research Fellowship, the value of which was stressed by subsequent speakers.

The Rugby College of Technology and Arts was visited on the last day by permission of the principal, Mr. W. Cooper, and there was a mid-week visit to the Shakespeare Memorial Theatre at Stratford-on-Avon.

VIEWS on the NEWS

By REFLECTOR

WHAT is a diamond jubilee? I have always thought it to be a sixtieth anniversary, but the *Electrical World* says that in 1954 " the year of light's diamond jubilee will be upon us." The reference is to the seventy-fifth anniversary of Edison's invention of the incandescent electric lamp. The *Electrical World* calls for fitting celebrations by the whole of the electrical industry as the invention marked the beginning of the electrical age. Some people believe that the electrical age really began a little earlier than 1879 with Faraday's discovery of electro-magnetic induction. Moreover some credit should be given in the celebrations to another Englishman—Sir Joseph Swan.

* * *

As a means of saving coal the Incorporated Plant Engineers, in a memorandum to the Ridley Committee on national fuel policy, suggests that the B.E.A. should divert its energies from the cultivation of the domestic field to the advocacy of railway electrification. While it is agreed that railway electrification is most desirable, why should it be considered as an alternative to or substitute for domestic electrical development? Surely the two could proceed side by side. What are the opinions of the Incorporated Plant Engineers' wives?

* * *

Since the last of the London trams disappeared evidence that these were not typical of modern practice continues to come in. There is no doubt that the policy of London Transport for many years—to allow the tramway system to die a slow and painful death—brought great discredit upon this form of electric traction. Blackpool has already been cited as a town in which enlightened management has maintained a tramway system which can handle expeditiously and pleasurably a volume of traffic which motor-buses would find it hard to cope with. Further examples quoted in the Press include Copenhagen. A correspondent to the *Manchester Guardian* is most enthusiastic about the magnificent new trams which he recently saw in that city. He considers that these " come near to being things of beauty " and gives some details of their construction and amenities. He says that " the most blessed comfort was the complete smoothness and silence: the axle boxes were mounted in rubber." Quite a contrast to the unlamented London trams. The correspondent concludes: " Sweden has even more elegant tramcars, but, of course, the Swedes know how to live."

* * *

Demands for electric power in the United States are insatiable. When the Tennessee Valley Authority was formed, largely as a flood control and irrigation body, there was uncertainty whether it could dispose of all the electric power which was its " by-product." There was no need for this doubt. Not only was all the hydro power readily absorbed, but the Authority found that it had to build steam stations. Its present programme envisages the addition of over 8,000 MW of steam plant to its system by the end of 1955; at this date two-thirds of the Authority's installed generating plant will be steam operated.

* * *

Writing to the *Evening News*, a lady says that although she has not a good word to say for the " corporate body of the British Electricity Authority " which endeavours to sell her appliances that will add to her " already scandalously high electricity bill " she considers the electricity showroom employees to be the most courteous people. I suppose she regards them as the innocent tools of the Authority, selling appliances only under duress. If they were free agents they would courteously recommend consumers to go without—or even turn to gas.

* * *

" Electric Instruments Profits " seems a most unlikely sort of heading for the General Electric Company's financial statement for the past year. It was used by the *Manchester Guardian*, which described the company as " makers of electrical instruments and machinery and allied engineering products."

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT the annual general meeting of the British Standards Institution, held on 23rd July, it was announced that the General Council had elected **Mr. J. Ryan,** C.B.E., M.C., as its chairman to succeed **Sir Roger Duncalfe,** who had completed his three years' term of office. **Viscount Waverley,** P.C., G.C.B., G.C.S.I., G.C.I.E., F.R.S., was re-elected president of the Institution for the third year, and Sir Roger Duncalfe was elected vice-president. Mr. Ryan is vice-chairman of the Metal Box Co., Ltd.

Mr. G. R. Stone, manager of the Birmingham branch of Z Electric Lamp and Supplies Co., Ltd., has resigned following his decision to take up residence in California. **Mr. J. R. Richardson,** for many years associated with the Nottingham and Derby depot, has been appointed as manager in Birmingham.

Mr. J. Walker, a director of the Morgan Crucible Co., Ltd., has been appointed to the board of Doulton & Co., Ltd.

Mr. J. H. Fairhead, of Boston, a commercial engineer with the East Midlands Electricity Board, is leaving the Board this month to become manager for Eric Winfield, Ltd., electrical engineers, Boston.

Mr. G. H. Foot, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E., has recently joined the Equipment Division of Mullard, Ltd., in charge of the telephone products group. Mr. Foot brings to the company wide experience in world telephone practice, both operating and manufacturing. For some years he was with the Companhia Telephonica Brasileira in Rio de Janeiro, and previously was with Siemens Bros. & Co., Ltd., at Woolwich.

Mr. G. H. Foot

Mr. G. W. Alexander, B.Sc., M.I.E.E., A.M.I.Min.E., and **Mr. A. T. Purse,** LL.B., F.C.I.S., have been appointed directors of Powell Duffryn Technical Services, Ltd.

Mr. Ian Quigley, B.Sc., A.M.I.E.E., has been appointed sales manager (export), lamps and lighting, by the British Thomson-Houston Co., Ltd. After taking his degree at Glasgow, Mr. Quigley joined Metropolitan-Vickers as a vacation and college apprentice in engineering. In 1927 he joined the Nigerian Government service where he worked as a telephone and telegraph engineer until 1932. On returning to England he joined the Calico Printers' Association and the following year went to the Central Electricity Board. From 1934 to 1939 he was an engineer with the Hotpoint Electric Appliance Co., Ltd., and he then joined the B.T.H. Lighting Department where he was concerned principally with infra-red equipment. In 1949 he became the company's representative on the manufacturers' committees, responsible for overseas lamp matters.

Mr. Ian Quigley

Mr. W. Butler, A.R.T.C., A.M.I.E.E., has now taken up his duties as consumers' engineer of the Bury District of No. 2 Sub-Area of the North Western Electricity Board. He was previously assistant power sales engineer with the No. 1 (Manchester) Sub-Area, a position he had held since 1950. Before nationalization Mr. Butler was development assistant to the consumers' engineer of the Salford Corporation Electricity Department.

Mr. K. Pugh has been appointed district manager at Bournemouth for Hoover, Ltd. Mr. Pugh joined Hoover, Ltd., as representative at Blackpool in 1946 and became a supervisor there in 1947. From 1948 until the present time he has been technical and staff instructor at one of the company's training schools at Nottingham.

Mr. R. A. Allen has been appointed sales manager of H. Frost & Co., Ltd. (incorporating H. Frost & Co. (Engineers), Ltd.), Walsall. Mr. Allen was formerly a senior sales executive of the Goodyear Tyre and Rubber Co. (Great Britain), Ltd.

A number of representatives of British electrical manufacturers were present at the recent convention of the Canadian Electrical Association in Banff, Alberta. The photograph (sent us by *Electrical News and Engineering*, Toronto) shows Messrs. E. M. Lloyd, British Insulated Callender's Cables, Ltd.; H. A. Cooch, president of the Canadian Electrical Manufacturers' Association; F. L. Laughton, president, Canadian Electrical Association; and H. G. McHaffie, British Thomson-Houston Export Co. The Canadian Electrical Association, now in its 62nd year, attracts more than 500 of the leading men in the utility and electrical manufacturing field to its annual convention.

Messrs. E. M. Lloyd, H. A. Cooch, F. L. Laughton and H. G. McHaffie at the Canadian Electrical Association s convention

The General Electric Co., Ltd., has announced the appointment to the board of **Mr. R. C. Giggins** (manager, Government Department), **Mr. J. J. Gracie** (general manager, Witton Engineering Works) and **Mr. T. B. O. Kerr** (secretary of the company).

Mr. R. C. Giggins started his training with the G.E.C. in the first world war period during which he also served with the Artists' Rifles and later held a commission in the Royal Engineers. In 1919 he joined the Newcastle branch, remaining there until late 1921 when he was transferred to the Singapore branch of Fraser & Chalmers Engineering Works, which later operated under the title of the parent company. As trade expanded Mr. Giggins opened the first G.E.C. branch office in the F.M.S. at Kuala Lumpur in 1927.

He returned to Singapore as G.E.C. general manager, British Malaya, in 1929 and extended the activities of the company to Java and other neighbouring countries. During his seventeen years in Malaya he helped in the initial stages of all phases of electrical development, and was a pioneer and later chairman of the British Malayan Broadcasting Corporation. In 1938 he was transferred to London and shortly afterwards was appointed manager of the Government Department. During the last war he was directly interested in the equipment for the Services as well as leading in the negotiations in connection with the company's shadow factories and extensions. After the war he carried through the negotiations for the acquisition of the wartime factories and plant and lately has been engaged upon the company's large contribution to the present rearmament programme.

Mr. J. Johnstone Gracie, C.B.E., M.I.E.E., F.I.I.A., Hon.A.C.T. (Birmingham), was educated at the City and Guilds Engineering College, London, and received his practical training at Short Bros., Bedford. In 1921 he joined the Osram Lamp Works as technical assistant and shortly afterwards was transferred to the production staff. The following year he transferred to the M.O. Valve Co., Ltd., to introduce quantity production methods in the manufacture of radio receiving valves. Returning to the Osram Lamp Works in 1928, he was placed in charge of production, and held this position until 1931, when he left to join a well-known firm of consulting engineers and in the capacity of chief engineer supervised on their behalf the reorganization of a number of factories in the Midlands. In 1937 he became general manager and director of Coldair, Ltd. (a G.E.C. subsidiary) and supervised the erection and layout of the new factory at Wembley. A year later he was appointed commercial manager of Witton Engineering Works and in 1940 became general manager. In recognition of his service as chairman of the Greater Birmingham Employment Committee, he was appointed a C.B.E. in 1950.

He is well known in broadcasting circles, particularly for his radio appearances in

Mr. R. C. Giggins

Mr. J. J. Gracie

Mr. T. B. O. Kerr

Town Forum and Midland Parliament, and his intimate knowledge of the requirements of industry is well illustrated in his book "A Fair Day's Pay." His appointments include that of life governor of Birmingham University, chairman of the governing body of the Birmingham College of Technology, member of the Council of the British Institute of Management, and president of the St. John Association, Birmingham. He is a Freeman of London.

Mr. T. B. O. Kerr was educated at Uppingham and Wadham College, Oxford, and joined the G.E.C. in 1930. Following a period as outside representative of the Sales Department, he joined the staff of the late Mr. M. J. Railing in 1932 and in 1935 became personal assistant to Sir Harry Railing. He was appointed assistant secretary of the company in 1947 and secretary in October, 1949. Mr. Kerr is a director of Woods of Colchester and of the G.E.C. Pension Fund Trustee Co., Ltd. He is also chairman of the Social and Athletic Club.

Last week we reported that **Mr. I. R. Cox,** managing director of the Metropolitan-Vickers Electrical Co., Ltd., had had the degree of Doctor of Science (*honoris causa*) conferred upon him by the University of Wales. The photograph reproduced herewith shows the Vice-Chancellor of the University, Principal J. S. Fulton, of University College, Swansea, admitting Mr. Cox to the degree after the presentation by Principal Anthony Steel, of University College, Cardiff. Later Mr. Cox was greeted by Lord Kenyon, acting Pro-Chancellor. Mr. Cox was trained with Metropolitan-Vickers and has been with the company ever since, except for the period of the first world war in which he gained the D.S.O. and Croix de Guerre. He is a director of Associated Electrical Industries, Ltd., and several companies of the group.

Mr. I. R. Cox being admitted to the degree of Doctor of Science by the Vice-Chancellor of the University of Wales

Mr. A. R. Jenkins, J.P., A.I.Mech.E., deputy managing director of Robert Jenkins & Co., Ltd., Rotherham, was installed as president of the Institute of Welding for 1952-53 at the annual general meeting of the Institute held on 22nd July at the Institution of Civil Engineers. Mr. Jenkins, who was educated as a mechanical engineer at Sheffield University and as a pupil apprentice with W. H. Allen, Sons & Co., Ltd., Bedford, entered the family business at Rotherham in 1931 as plant maintenance engineer. Shortly afterwards he took charge of the Works Progress Department, became works manager and a director of the company in 1934 and in 1946 was appointed works director. Mr. Jenkins serves on the Council of the British Welding Research Association. **Mr. H. B. Fergusson,** M.I.N.A., M.I.Mech.E., M.E.I.Canada, is the new vice-president of the Institute. He is a director of G. A. Harvey & Co. (London), Ltd.

The Eastern Electricity Board has appointed **Mr. P. Sydney** to be manager of the Suffolk Sub-Area, in succession to Mr. H. J. Wright, and **Mr. S. F. C. Whitmore,** A.M.I.E.E., to be manager of the Chilterns Sub-Area, in succession to Mr. P. G. Campling. For many years Mr. Sydney was the general manager of the Cambridge Electric Supply Co., and, since nationalization, has been commercial officer of the Fens Sub-Area.

Before nationalization Mr. Whitmore was manager of the North Essex Division of the East Anglian Electric Supply Co., Ltd., and he has since been manager of the North Essex District of the Board.

Mr. Donald A. Quarles, president of the Sandia Corporation and vice-president of the Western Electric Co., has been elected president of the American Institute of Electrical Engineers for 1952-53. Among the new vice-presidents is **Mr. Thomas Ingledon** of the British Columbia Electric Co.

Last year the Birmingham Electric Club inaugurated a scholarship open to part-time students in the Electrical Department of the College of Technology, Birmingham. The arrangements provided that the holder should visit some establishment connected with electrical engineering, in Great Britain or abroad. The Club has just made the first award under this scheme, the winner being **Mr. M. O. Jackson,** an apprentice at the Witton works of the

General Electric Co., Ltd. It is hoped that Mr. Jackson will be able to visit France to broaden his knowledge of electric traction.

The board of the Brush Electrical Engineering Co., Ltd., has awarded its annual scholarship to **Mr. R. G. Beckett,** a student apprentice, who joined the company in 1950. The value of the scholarship is £150 per annum for three to four years, and enables the holder to study for an honours degree in electrical or mechanical engineering. Mr. Beckett, aged twenty, is a British subject who was born in Tangier, Morocco.

The Ministry of Fuel and Power has announced a number of appointments and reappointments to Electricity Consultative Councils. **Mr. J. E. Nelson,** M.I.E.E., is a new member of the Merseyside and North Wales Council and reappointments include **Mr. E. J. Evans,** M.Sc., M.I.E.E., M.I.Mech.E., A.M.I.C.E.; **Mr. H. Evans,** J.P., continues as chairman. **Ald. H. Leason,** J.P., A.M.I.E.E., is reappointed chairman of the Midlands Council, and **Ald. the Rev. R. A. Giles,** M.A., is the new deputy chairman. The members include **Col. Sir John Kent,** C.B.E., and **Mrs. G. E. Crabtree,** J.P.

Members of the Swinton and Pendlebury Council recently paid an informal visit to Agecroft power station where they viewed the methods which are in operation to combat atmospheric pollution. Following the visit, Councillor A. M. Inman, chairman of the Health Committee, said that he was satisfied that everything was being done at Agecroft to minimize smoke and dirt pollution of the atmosphere. **Mr. A. R. Cooper,** controller of the North Western Division, B.E.A., welcomed the party on arrival and after they had been conducted round the station, Mr. J. L. Ashworth, chief generation engineer (operation), gave a brief lecture, which was followed by demonstrations and films showing the methods used.

At Penydarren Park, Merthyr Tydfil, recently an inter-factory sports meeting was held, when eleven of the factories in the district competed for twenty-five trophies. Winners were **Hoover (Washing Machines), Ltd.,** who won eighteen of the trophies.

The final of the Merseyside and North Wales Area of the **E.I.B.A. National Golf Competition** will be played at Heswall Golf Links on 26th August. The major event will take place in the morning, and a greensome competition during the afternoon.

Presenting prizes to apprentices employed by **C. A. Parsons & Co., Ltd.,** Sir Claude D. Gibb, chairman and managing director, said that the shortage of skilled workers was more serious than the shortage of materials. The company had the biggest order book in its history and could employ another 300 fitters, turners, welders, moulders and pattern-makers. Sir Claude presented the "highest merit apprentice" cup to 19-year-old John Russell; the senior apprentices' vocational prize to J. W. E. Carlson; and the junior vocational prize to L. H. Teasdale. A new apprentices' school, several times larger than the present premises, is nearing completion at the company's works at Heaton. A large new research and design building, also under construction, is expected to be ready for partial occupation in October.

OBITUARY

Mr. John Cunliffe, of Ashton, near St. Helens, secretary of Wigan branch of the Electrical Contractors' Association, died last week. He was fifty-six.

Mr. A. H. Hoggins, director of Walsall Conduits, Ltd., died suddenly on 22nd July, at the age of sixty-seven. Mr. Hoggins, who was manager of the Tube Mills Dept., had been with the company for thirty-two years.

WILLS

Mr. Francis Thursfield, M.I.C.E., M.I.E.E., formerly general manager of the Leicestershire and Warwickshire Electric Power Co., who died on 12th April last, left £22,125 (£21,916 net).

Mr. R. G. Ward, M.I.E.E., formerly for many years associated with John Brown & Co., Ltd., former chairman of the I.E.E. Sheffield Sub-centre and of the North Midland Centre, who died on 16th April last, left £997 gross (£923 net).

Mr. L. P. Freeman, A.M.I.E.E., managing director of Aron Electricity Meter, Ltd., who died on 15th March last, left £11,467 gross (£10,026 net).

Aluminium Development

THE abridged annual report on the 1951 activities of the Aluminium Development Association indicates that, although the shortage of aluminium increased the difficulties of undertaking short-term projects, long-term development work progressed. The report shows how information is being disseminated in many ways while the important A.D.A. research activities were mainly concerned with welding, large riveted joints, structural engineering, corrosion problems and finishes for aluminium. Details are included of marine fire tests in connection with aluminium. The electrical industry's interest in light metal conductors and components has been maintained while the A.D.A. work with respect to British Standards for light alloys is continuing.

Cambridge Chair Commemoration

TO commemorate the endowment by the British Electrical and Allied Manufacturers' Association of a Chair of Electrical Engineering at Cambridge University the Worshipful Company of Goldsmiths has been authorized by the B.E.A.M.A. to announce a competition for the design of a rosewater dish and ewer to be presented to the University. The plate will be held in the custody of the College of which the professor is a fellow during his occupation of the Chair.

It will symbolize the University (whose arms will be engraved on the centre of the dish and on the ewer) and all the colleges whose arms will appear round the rim of the dish. The plate will embody the names of the successive professors and an inscription setting forth the object of the dish and ewer. The cost of the plate should be about £600 exclusive of purchase tax. Prizes of £100, £50 and £10 are offered for the design, which will be adjudicated upon by a panel including Messrs. T. F. Lister, D. D. Walker and G. L. Wates as representatives of the B.E.A.M.A.

Entries are to be sent to the Goldsmiths' Company by 3rd October and full particulars can be obtained from the Worshipful Company, Goldsmiths Hall, Foster Lane, London, E.C.2.

Research Expenditure

THE second statistical survey of scientific and industrial research conducted by the Federation of British Industries, based on returns from 301 firms, each spending not less than £2,000 a year on this work, shows that these firms spent nearly £24 million on research during 1950–51. While it is not possible from these figures accurately to estimate the total expenditure of British industry on research, comparison with the first F.B.I. survey of 1945–46 suggests that the total has increased by not less than 50 per cent.

Further evidence supporting this conclusion is the fact that the majority of the 301 firms have increased the number of qualified staff (31,000) they employ on this work by an average of approximately 52 per cent and floor space used for research and development departments has increased by 54 per cent.

Research and development expenditure, expressed as a percentage of turnover, for seven industrial groups ranges from 0·4 to 5·3. Although a uniform relationship between research and turnover is not to be expected, this ratio can be used to indicate whether the scale on which research is being carried out is of the right order, and also for comparative purposes as between firms in the same industry.

From 69 to 98 per cent of the total research expenditure, according to the industry, is incurred on projects originating within the firm. Nearly all the remainder is incurred on projects resulting from technical sales service. Only from 1 to 2 per cent of the total is spent on outside or sponsored research.

Certain features of research organization have changed only slightly since 1946. The proportion of firms which are members of a co-operative research organization (usually a research association), the ratio of unqualified to qualified staff in research and development departments, and the distribution of firms by research expenditure in industrial groups (after allowing for the general increase in expenditure) were not significantly different last year from what they were in 1945–46.

Large Canadian Order

AN order worth nearly $3 million for flight simulators for "Sabre" jet fighter aircraft has been placed by the Canadian Government with Redifon, Ltd., the manufacturing company of Broadcast Relay Service, Ltd. It is claimed to be the largest dollar order for electronic equipment of this type ever placed in the United Kingdom.

The flight simulator produces on the ground by electronic means the various conditions experienced by aircrews in actual flight. The flight deck is exactly reproduced, with all instruments normally installed in the aircraft, which continuously and cumulatively register in the same way as the corresponding instruments in flight. The simulator enables aircrews to undergo periodic training checks, or conversion courses, and to familiarize themselves with the procedures and emergency drills necessary under both normal and abnormal conditions. The instructor is able to introduce emergency or adverse conditions, calling for corrective action on the part of the pilot.

Redifon, Ltd., has previously provided a flight simulator to train crews of the B.O.A.C. "Stratocruisers" and is now delivering one for the new "Comet" jet airliner. Simulators for other types of aircraft are now in the design or production stage.

The negotiations for the contract, in competition with the United States, were initiated by Mr. Paul Adorian, assistant managing director of Broadcast Relay Service, Ltd., and chairman of Redifon, Ltd.

Electrically Operated Doors

Head Wrightson & Co. (Aluminium), Ltd Thornaby-on-Tees, have received an order for the construction of four electrically-operated doors for London airport. The doors will cover an opening 300ft long and 46ft high and weigh 180 tons.

PARLIAMENTARY NEWS

From Our Special Reporter

DURING a debate in the House of Commons last week on the work of the Monopolies Commission, Mr. Dalton complained that the whole procedure was desperately slow. Since March, 1949, when the Commission began work, it had made only four reports—on the supply of dental goods, rain-water goods, electric lamps, and insulated electric wires and cables. Although the report on electric lamps was made in November, 1951, it was not until 19th May of this year that the Minister of Supply had said that both the Government and the Electric Lamp Manufacturers' Association had accepted the Commission's recommendations, except for the abolition of the rebates. He would not develop that. They had been told that a new scheme promoted by E.L.M.A. was to have come into force on 1st July. Were they to see this new scheme and be able to exercise their own judgment whether, on the face of it, the recommendations of the Monopolies Commission had been carried out?

In the case of insulated cables the report had only just been received, and it was not reasonable at present to expect action. He would hope that in these cases they would get an Order. Assurances were all very well, but the whole purpose of the Act was to give new power to the relevant Minister to make an Order and to ensure that the objectionable practices should become illegal as from the date of the Order.

Mr. Peter Thorneycroft, President of the Board of Trade, agreed that the procedure had been somewhat slow in starting. It took time to get the information; it was quite a large undertaking to make an inquiry into a whole industry. As regarded the electric lamp report, the Commission did not insist on the end of the common manufacturers' price, which was the notable feature of E.L.M.A., but it did call for the abolition of certain collective arrangements of a restrictive character, and the Minister of Supply announced the Government's agreement with the Commission's findings. The industry had amended its rules, with one technical exception—the question of aggregated rebates—which he was perfectly prepared to deal with if the matter was raised in debate. In broad principle, however, the industry had amended its rules to take account of the report of the Commission and the decision of the Government.

General Review of Trade Practices

It had always been the opinion of the Government that the accumulation of case studies of that kind might suggest that particular practices were widespread in industry. The reports of the Commission raised a very strong presumption that such practices did exist. In each case the Commission had found a complex restrictive system of distribution. They had a strong family resemblance, and were contrary to the public interest. They were known to exist in many other trades not yet examined, and in his view the time had come when they should seek some general advice on the desirability of these practices. Section 15 of the Act provided a basis for a consideration of that kind, although in the form bequeathed to the Government it was not wholly satisfactory. He proposed to ask the Commission to undertake at an early date a general study based on the reports of some of these practices. While matters were at this stage he would not be expected to announce the precise scope of the inquiry, but in each of its reports the Commission had criticized certain aspects of exclusive dealing and common boycott. This practice was clearly a strong candidate for early examination.

Competition in Lamp Industry

Mr. Tomney said that by 1950 six large companies controlled the financial interests of the electric lamp manufacturing business of this country. Only one lamp manufacturing company was outside the scope of E.L.M.A. contracts. Since the institution of the Monopolies Commission, E.L.M.A. had been making efforts to put its own house in order. The price of the 100 W electric lamp, which was the highest in the world in 1939, was now possibly one of the lowest. Possible solutions had been suggested by the Commission. One member, Miss Joan Robinson, had suggested that the five E.L.M.A.-controlled companies could possibly be bought up by the Government and operated as an agency which would provide competition. That seemed attractive, but he did not think it told the whole story, because, with the exception of Britannia Lamps, most of these other lamp manufacturers were small concerns. He did not think it was really worth the Government's while to adopt the suggestion but it was possible that the Government would be able to offer more serious competition if it was to embark upon a process whereby it manufactured lamps for the services which it directly operated. He referred to a whole range of products manufactured by E.L.M.A. and sold to the Government for exclusive Government use. One particular instance was that of telephone lamps in telephone exchanges. There was no apparent reason why the General Post Office should not

control the manufacture of its own lamps. The British Electricity Authority used thousands of lamps, fluorescent and otherwise. Why should it not embark on the manufacture of its own products? There was no reason why the Forces, who, in face of ever-increasing technical complexity, were more or less relying on the electronic industry for new devices, should not begin to manufacture these for themselves. It would be an incentive to the companies to increase competition among themselves and thus bring prices down. Research by a company started by the Government would, he was sure, be most successful.

Suppressors on Cars

Mr. Langford-Holt asked the Assistant Postmaster-General when it was proposed to produce a regulation requiring motor-cars to have suppressors to prevent interference with television reception.

Mr. Gammans said that the Postmaster-General hoped to make a regulation covering new motor-cars early next session.

Mr. Langford-Holt asked whether this regulation would impose an obligation and would not rely in any way on a voluntary system. Mr. Gammans said that it would certainly impose an obligation in the case of new cars. As regarded existing cars, up to now the Government and its predecessors had wished to see to what extent this could be carried out voluntarily. It had been pretty successful; the number of suppressors fitted now exceeded 300,000 a month.

Merseyside Charges

Mr. Kenneth Thompson asked the President of the Board of Trade whether his attention had been called to the disproportionately high charges made for electricity for industrial purposes by the Merseyside and North Wales Electricity Board which were having a deterrent effect on the establishment of new industries in the Merseyside Development Area; in how many cases had this factor been represented to him as deciding industrialists to establish their factories elsewhere; and if he would consult with the B.E.A. with a view to the reduction of these tariffs.

Mr. Henry Strauss said he was informed that a complaint had been made to the Ministry of Fuel and Power about electricity charges in the Merseyside area, but the Electricity Act, 1947, provided machinery for dealing with such complaints. He did not know of any case in which electricity charges had deterred the establishment of a factory in the Area.

Protection of Amenities

Mr. J. T. Price asked the Minister of Housing and Local Government what was the policy of his department regarding the continued disfigurement of natural beauty spots by pylons and overhead electric lines; and if he would seek powers to restrain the British Electricity Authority in these activities.

Mr. Marples said that overhead electric lines in general already required the approval of the Minister of Fuel and Power, and he was required by statute to consult the local authorities concerned before reaching a decision. The Minister of Housing and Local Government was consulted if objections were made on account of disfigurement of natural beauty or prejudice to other amenities. No question of seeking further powers therefore arose.

Electric Fishing Machines

Major Tufton Beamish asked the Minister of Agriculture what approach had been made to him by the Great Ouse River Catchment Board with regard to an electric fishing machine; what ruling he had given in this matter; and if he would take powers to ban the use of such devices except with his approval.

Sir Thomas Dugdale said that the River Boards already had power to determine the instruments which might be used for fishing and the conditions under which they might be used. The Great Ouse River Board had asked his Department to advise it on the drafting of a bye-law to prohibit the use of electric fishing machines except under licence. His Department was advising it as requested, but the bye-law would have to be advertised, and any objections received would have to be considered before it was put to him for confirmation.

National Fuel Policy

In reply to a question on Monday the Minister of Fuel and Power (Mr. Lloyd) said that he had that morning read the report of the Ridley Committee on national fuel policy. The report would be presented to Parliament in the form of a Command Paper and it should be available from the printers in about six weeks.

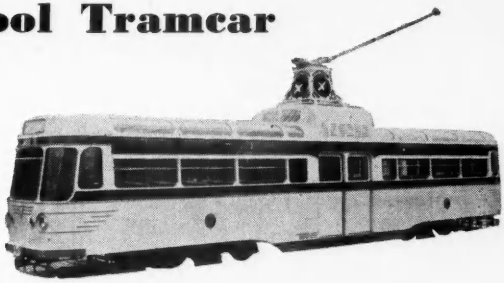
Sale of Traction Undertaking

Mr. James Griffiths asked the Minister of Transport why he authorized the South Wales Electricity Board to sell the Llanelly traction undertaking to the South Wales Transport Co. without prior consultation with the Llanelly Borough Council which had an option to purchase under the provisions of the Llanelly District Traction Act, 1930.

Mr. Lennox Boyd said that under the Act of 1930 the Board had power, with the consent of the Minister of Transport, to sell the undertaking at any time either to the Llanelly Corporation if the Corporation should have decided to purchase, or to any company or person. In those circumstances it was not considered necessary to consult the Corporation before giving consent to the Board's proposal to sell the undertaking to the company which was well fitted to take it over.

New Blackpool Tramcar

Design Providing Very Smooth Operation



AT the time when London was saying good-bye to the last of its trams the Blackpool Corporation was putting into service the first of twenty-five of a new class of single-deck cars being built by Charles Roberts & Co., Ltd., Horbury Junction, near Wakefield. This car incorporates original features which make it an outstanding example of modern tramcar design.

The body, with seating for 56 passengers, has a well-type underframe, dropped between the bogies to permit a low central platform with a minimum step height. The body is carried on two Maley & Taunton hornless equal-wheel bogies. Each bogie is equipped with two Crompton Parkinson traction motors rated at 45 h.p. at 275 V. Each axle is motored, the drive being through Cardan shaft and spiral bevel gears.

Interior of the car which seats 56 people

The wheels are of the resilient type, introduced by Crompton Parkinson, in which there is no metal-to-metal connection between wheel hub and tyre, torque being transmitted and shocks absorbed by large masses of rubber in shear. Normal braking is by rheostatic means, the car being brought finally to rest by air wheel brakes which also serve to hold the car on a gradient. There are also magnetic track brakes for use in emergency.

The control gear is of the Vambac type. The main feature of this is the accelerator, an arrangement of resistance grids in a circular group. A motor-driven arm rotating within this group switches in succession about 90 control notches. The arm motor is automatically regulated in speed according to the setting of the single driving lever, in conjunction with the control imposed by automatic safeguards to prevent overloading. The arm carries permanent magnets which operate the resistor step switches.

The accelerator is similarly used for rheostatic braking. Both acceleration and braking are controlled by the driving lever which is pushed forwards or backwards respectively. In each case the rate is automatic and variable, dependent only on the extent to which the lever is moved. The control equipment was built by Allen West & Co., Ltd.

The air brakes are arranged so that the conductor can stop the car independently of the driver by using a small lever mounted on the door jamb of the central platform, this brake being also provided with a "fail-on" which operates automatically in the event of any damage to the piping.

The central entrance doors are of the sliding type, pneumatically operated by a long stroke engine with electromagnetic

control. These doors have a particularly wide aperture, the length of travel being greater than that of the London Transport stock as the distance between the side pillars is 6ft 3½in. The door equipment is by G. D. Peters & Co., Ltd. The trolley boom is carried on a tower, over the main centre platform, which also houses the accelerator unit.

The overall length of the car is 50ft, and the distance between bogie pivot centres 25ft. The bogie wheel base is 6ft and the diameter of the wheels 2ft. Overall height from rail to top of roof is 9ft 11⅝in; the interior height in each saloon is 6ft 1in; and the length 18ft. The overall width of the car is 7ft 11in and the minimum clearance from underframe to rail level 6½in. The maximum running speed is estimated at 40–45 m.p.h.

B.T.H. " warm white " 30 W fluorescent lamps are used to illuminate the interior; they are fitted along the centre line of the roof. Separate incandescent lamps in bowl shades are mounted over the entrance and there is an emergency lighting system.

The manager of the Blackpool Corporation Transport Department is Mr. W. Luff.

Public Transport in Edinburgh

The Case for Retention of Trams

A RECOMMENDATION that the tramway system in Edinburgh should be completely abandoned within three years has been remitted to the Transport Sub-Committee by the Corporation's Civic Amenities Committee. A special sub-committee on the future policy of the transport undertaking had recommended that the alternative form of transport should be motor buses. It considered that trolley buses would be unsuitable for the centre of the city.

Commenting on the proposals, the British Electrical Development Association says that the estimates given show the trams in a disadvantageous light and it has prepared a lengthy list of figures and facts to demonstrate that the tram—and not the bus—is the better and more economical form of transport to-day and in the foreseeable future.

It is assumed, the Association states, that large buses would be required. Chassis prices have recently been increased and therefore £4,000 (the price stated at the Corporation meeting) appears to be too low a figure. A double-deck, 56-seater bus is not likely to be obtainable under £4,500 to-day. Three hundred buses at this price would cost £1,350,000, and this money (likely to be increased) would have to be spent every ten years. Thus in thirty years the total would be £4,050,000. If, however, 300 trams were obtained at £10,000 each, they would last at least 30 years, so that the total would be £3,000,000. To the cost of the buses would be added the cost of road reinstatement and depots, £650,000. In the case of trams the cost of permanent ways would have to be added. From these figures there would be £1,650,000 available for this purpose.

If it is said that buses will last longer than ten years, the same can be said of trams as they can also have a longer life than thirty years. The Association also contends that by scrapping trams there would be a loss in local rates of at least £20,000 a year. Regarding operating costs for 1951–52, the figure for trams in Edinburgh was 21·991d a mile and that for buses 22·124d a mile. For 1952–53 the cost of operating buses will be at least 1d a mile more for fuel. In 1951–52 trams showed a credit balance of 2·289d a mile, while buses showed a debit balance of 1·218d a mile. There is also a credit or benefit to the citizens of Edinburgh in respect of heavy road maintenance costs.

Substitution of buses for trams would mean increasing imports of oil which, the Association states, is bad for national economy. Oil fuel would also become scarce in the event of war and might even be unobtainable. Since 1940 the rise in price has been over 230 per cent, whereas the price of electricity has increased by only slightly over 50 per cent. Finally, trams help to keep a city clean as they do not pollute the atmosphere with smoke and fumes, which are costly in health and also in money.

Power Laundry Directory

THE third edition of " Power Laundry Directory and Who's Who " published by Trader Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1, at 10s 6d is the most comprehensive and reliable reference work of its kind, used in all parts of the world. The 1952 edition contains a completely new " Who's Who," a buyers' guide listing the names of over 1,000 suppliers, a directory of trade and professional associations, and numerous other pages of essential information, all of which has been revised and brought up to date.

E.R.A. REPORTS

Recent Publications

AMONG technical reports recently released for publication by the Electrical Research Association are the following:—

J/T154 (price 7s 6d + 3d) on "The Effect of Cold Drawing on the Creep Resistance and Structure of 0·5 per cent Molybdenum Steel Steam Piping," by E. A. Jenkinson, M.Sc., A.I.M., and D. C. Herbert, B.Sc.(Eng.), A.I.Mech.E., records the results of tests made at the N.P.L. As it was considered that the use of cold drawn pipes, having smooth surfaces, would be a precaution against failures due to cracking in service which occurred some time ago, tests were carried out to determine how cold drawing might affect the creep resistance and graphitization of the steels.

Circuit Breaker Investigations

G/XT132 (price 15s + 4d) on "Gas-Blast Circuit Breakers: the Technique of Recording Current in A.C. Power Arcs around the Period of Current Zero, with some Applications," by F. O. Mason, which discusses various methods of recording currents under the circumstances indicated. In particular the recording of such current by amplifying the voltage drop across a resistance element of low value in series with the circuit in which current is to be determined is dealt with in some detail. Misleading results which might be obtained from deficiencies in the design of the recording equipment are illustrated, while sources of error and requirements of the apparatus necessary to avoid them are given detailed attention.

G/T249 (price 18s + 4d) on "Oil Circuit Breakers: Pressure Set Up by Sudden Increase of Fault Current in an Arc Control Pot," by W. B. Whitney, H. W. Baldrey and A. E. Helden, describes the results of experiments carried out to determine pressure likely to be set up in a h.v. arc control pot (of type described) under the somewhat rare operating conditions in which a long low-current arc suddenly develops into a long high-current one due to occurrence of a short circuit at a later stage in arcing. This report additionally describes the development of formulæ and graphical methods for calculating the pressure set up in the arc control pot under other conditions than those used in the experimental work.

L/T266 (price 9s + 3d) "On the Torsional Vibrations of Long-Chain Molecules I," by B. Szigeti, discusses simplified models for long-chain molecules in which all units are equal, except for one, which is heavier than the others. Certain general conclusions are reached for the vibrations of such molecules. The results will be applied to the out-of-plane, or torsional, vibrations of long-chain ketones in L/T267 (price 9s + 3d) on "The Torsional Polarization of Long-Chain Ketones," by B. Szigeti, which considers long-chain molecules in the extended configuration, the interaction between molecules being neglected. The out-of-plane vibrations consist of a superposition of a translational and a rotational motion; the relation between the amplitudes of these two is derived. For long chain ketones, with the CO-group near the centre of the chain, the mean square amplitude of the torsional vibration of the CO-group is calculated. At any particular temperature it is approximately proportional to the chain length. The polarizability of ketones connected with the torsional vibrations is calculated and turns out to be very large compared with the usual effect of internal vibrations. Although this polarizability is contributed by harmonic internal vibrations, it nevertheless forms part of that term in the total polarizability which is usually called the orientational polarization.

Capacitor Transformer Design

Q/T119 (price 4s 6d + 3d) on "The Equivalent Circuit of the Capacitor Transformer," by M. Waters, B.Sc., A.M.I.E.E., follows up Q/T104 and Q/T108, which have shown how to design capacitor transformers to comply with given performance data, and indicates that (for a given design) the performance may be determined from a simple equivalent

circuit which is similar to that of an ordinary transformer.

A method of calculating the fault current drawn from the line on the occurrence of a fault between turns has been given in Q/T103 for a single-phase transformer wound on one limb. The procedure is extended in Q/T121 (price 6s + 3d) on "The Calculation of Currents Due to Faults Between Turns in Transformer Windings," by B. L. Coleman, B.Sc., to a single-phase transformer wound on two limbs and to the simpler three-phase transformer connections. This report is a first approach to the problem and deals only with faults in that winding which is connected to the supply.

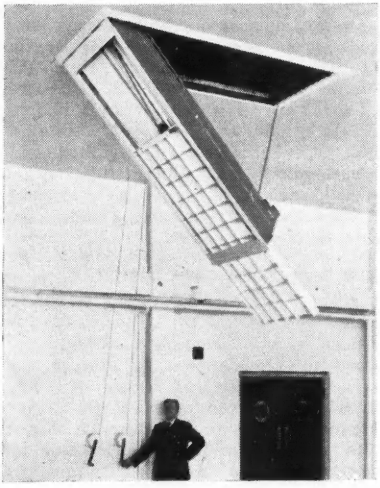
These reports are obtainable from the E.R.A., Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

Control Room Lighting

IN order that the overhead lighting equipment in a large control room of the British Electricity Authority can be effectively maintained without hindering operations by the control personnel, the Edison Swan Electric Co., Ltd., in co-operation with the architect, has produced an original type of recessed louvred ceiling laylight. The fittings, which are mounted at a height of 14ft above floor level, are arranged so that servicing can be carried out by a single person without ladders.

The laylight consists of a fixed outer frame in which is hinged a sub-frame carrying the lamps and reflectors. The hinged frame has a louvre fitted within it as a sliding extension which opens progressively as it is lowered. The whole operation of opening or closing is automatically controlled as one sequence by a self-sustaining hand winch. The unit is secured at its free end by a catch which can be released by hooking on to it an end-loaded light alloy tube and, as the winch is rotated, the laylight frame and extension louvre section swings down to the vertical position.

"Ediswan" laylight with hinged frame being lowered and louvre section sliding out of frame to reveal lamps and reflectors



The instant-start control gear is mounted directly on the steel structure of the ceiling in the form of unit assemblies for each lamp. Special plug and socket connections to the supply and lamps permit isolation tests to be carried out, so facilitating the replacement of any defective lamp or component. Since the catch mechanism is self-locking, winding of the winch by itself will not lower the laylight, and an additional safeguard is the fact that the weight of the release tube is insufficient to open the catch unless it is relieved of the load of the fitting by the winch.

The principle of operation, which depends only on a simple winch and pulley gear, is applicable to all sizes of louvred or glazed laylight fittings and these may also prove useful for installation in hotels, public buildings, picture galleries, museums, etc.

Silvered Reflectors

THE minimum requirements for silvering glass reflectors for lamps are set out in B.S.1871, which has been issued as an alternative to a general specification of performance because the latter is not possible since satisfactory means have not yet been devised for testing the salient features of a good reflector. This Standard deals with two types for (*a*) heavy duty outdoor and abnormal interior situations and (*b*) general commercial, industrial and domestic service. Copies of the publication are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1, price 2s post free.

Wiring Queries

Interpretations of I.E.E. Regulations

THE following notes are selected from replies by the I.E.E. Wiring Regulations Committee to requests for interpretations of certain requirements. The numbers of the relevant regulations in the Twelfth Edition are given in parentheses.

One inquirer asks if three 5 A socket outlets on one circuit wired with 3/·036 cables (10 A rating) and fused for 5 A would be permissible. The answer is that the rating of the cable is required to be not less than the normal maximum current, taken as 15 A (202E) subject to diversity factor (303), but it must be at least 10 A (202D). Where a final sub-circuit feeds several points the rating of flexible cords (unless protected by fuses in the plugs) must be such that a sub-circuit fuse capable of carrying normal load will adequately protect them. An alternative would be to install 13 A fused plugs and socket outlets (as described in 201C).

Socket Outlets on Ring Circuits

A second inquirer was informed that 13 A three-way socket-outlet adaptors should not be connected to a ring circuit (201C). Those recognized (1301) comply with B.S. 546 and are unsuitable for 13 A socket outlets made to B.S. 1363. Another question related to the use of a 13 A fused plug and shuttered socket outlet with a 15 A switch on a d.c. ring circuit (201C). Clearances on some makes, while complying with B.S. 1363 as regards a.c., may be insufficient for breaking d.c. by withdrawal of the plug and the switch would need to be interlocked with the socket outlet to prevent this. Also the fuse to B.S. 1362 is not suitable for large d.c. fault currents. A B.S. for a switch socket outlet and fused plug suitable for d.c. is under consideration.

Other replies indicate that, where diversity allows (202D), a 10 A circuit, which must not be fused for more than 10 A (202A), could properly supply three 5 A socket outlets with fuses in the plug not exceeding the rating of the flexible cord. The looping of conductors into the fuses of final sub-circuits, where the supply of more than one point is permissible, is not prohibited so long as the current rating of the fuse protecting a circuit does not exceed that of the smallest cable connected to it (202) except as regards socket outlets feeding fused plugs (201C). If a fuse protecting a sub-circuit is capable of protecting a pilot lamp, no further fuse is necessary (203B). The use of clock connectors for other purposes is not recognized as complying with the regulations (1312).

Dual Use of Conduit

Cables for supplying 400 V three-phase and 250 V single-phase circuits may be run in the same conduit, subject to prescribed conditions (411 and 612E). It is not permissible, however, to run telecommunication cables, even when of 250 V grade or screened microphone type, in the same duct as lighting and heating circuits (315C). Cable from which the protective sheath has been removed must be enclosed within a box (404J) unless already enclosed in an accessory fitting. For surface wiring with incombustible surroundings the base of the recess may be, instead of a box, the finished surface of a wall or ceiling and its front may be the accessory itself. An incombustible pattrass block mounted on an incombustible surface would not be ruled out. Concrete ducts are allowable subject to conditions applicable to other forms of conduit (405 and 406). Tough rubber sheathed cable to B.S. 7 is considered satisfactory at medium voltage if protected where required against mechanical damage (411).

A stop button which, when released, allows a motor to restart does not comply with the regulations (703). Neither a distribution fuse board nor a consumer's control unit in a t.r.s. installation satisfies the requirements unless it has an incombustible back.

Tower Bridge Floodlighting

The City of London Corporation Bridge House Estates Committee has approved a proposal for the floodlighting of Tower Bridge during the tourist season 1952 at a cost not exceeding £1,000.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

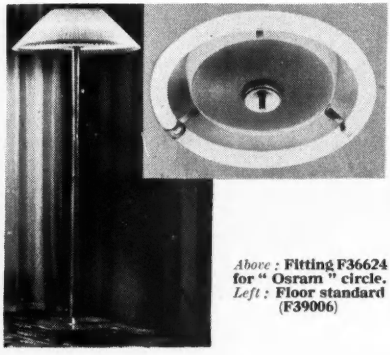
Capacitor Start Motors

THE latest addition to the range of capacitor start motors made by SMALL ELECTRIC MOTORS, LTD., Eagle Works, Churchfields Road, Beckenham, Kent, is a 1·5 h.p. screen protected machine which runs at 1,420 r.p.m. It has been designed specifically for heavy duty drives and is physically interchangeable with its counterpart in the company's three-phase high torque range. Production of these machines is planned for the end of 1952 and already orders have been received from overseas.

Fittings for Circular Fluorescent Lamps

The latest range of lighting fittings to be introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, are intended for use with the " Osram " circle, a 16in diameter circular fluorescent lamp. The fittings are suitable for the home, hotels, restaurants, theatres, cinemas, commercial buildings and shops; wherever, in fact, a decorative fluorescent fitting housing a lamp of medium light output is required. The first few models in the new range comprise ceiling and pendant units and a floor standard.

The simplest design (F36624) is a ceiling fitting, the basis of which is a cream coloured metal spinning housing the control gear and supporting the lamp. The overall diameter with tube is 16in and the depth 4in. A more elaborate variation of this (F36625) has a white flashed opal glass disc below the lamp and a pleated paper diffuser; this model is available either in the form of a ceiling or pendant fitting. A similar range of fittings incorporating the tungsten ballast circuit will also shortly be available (simple design F36626 and decorative type F36627). An attractive floor standard (F39006) in West African agba wood finished to a natural walnut colour, with brass relief, has a pleated paper shade and the " Osram " circle is screened from below by an obscured glass disc.



Above: **Fitting F36624 for " Osram " circle.** *Left:* **Floor standard (F39006)**

Safety Ceiling Rose

A ceiling rose now available from BRINKMAN & MCINTYRE, LTD., Oxford Road, Benson, Oxford, is designed to prevent the unauthorized operation of heating appliances off lighting circuits. This Armstrong ceiling rose is conventional in appearance and can be installed without any special fitting or adjustment. Its patented feature is the incorporation in a sealed chamber of a small thermal cut-out which breaks the circuit within a few seconds if the load exceeds a predetermined figure. After a short period the circuit is automatically remade but is immediately broken again if the overload is still connected. This continues indefinitely until the overload is removed. The standard model is available in white moulded material for use on 200/250 V a.c. mains and is adjusted to cut out at a load of about 1 A. Other models to suit customers' particular requirements can also be supplied.

Mobile Spot Welder

The " Power-in-Hand " mobile and pedestal conversion spot welder introduced by THOMAS P. HEADLAND, LTD., 166, Westminster Bridge Road, London, S.E.1, is likely to find numerous applications in the electrical industry as well as in garages, etc. The welding capacity covers any thickness up to 2 × $\frac{1}{16}$in mild steel or 18 gauge to $\frac{3}{16}$in mild steel with normal throat depth of 12in. A 24 step electronic timer affords weld control from 3 cycles ($\frac{3}{50}$ sec) to 5 sec.

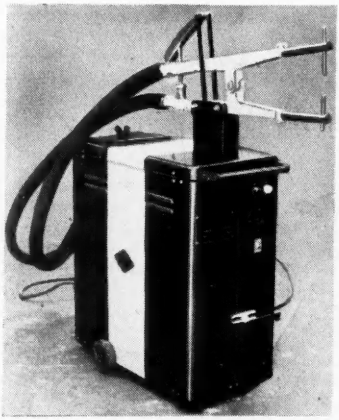
The welding head incorporates a patent design of leverage exerting a pressure of 160 lb at the electrodes with follow-through switching incorporated in the hand lever. Electrodes and electrode arms are made of standard diameter resistance welding material and interchanging and adjustment are made simple by socket screw clamping. The welding head, weighing 13 lb, is connected to the machine by 5ft flexible cables.

Standard electrode equipment includes a pair

of standard electrodes, a pair of off-set electrodes made from ⅜in diameter resistance welding material, an anvil welding attachment comprising a gunmetal adaptor with two anvils, and a special electrode and spacer for welding in circumstances which cannot be met with the standard throat depth. Push weld or prod weld electrodes are also provided and a claw weld attachment is available as an extra for operating in restricted spaces.

Solid rubber tyred wheels ensure ease of mobility, while handles at both ends of the casing enable the equipment to be lifted or slung from overhead tackle. An accessories compartment built into the casing is provided with an inspection panel giving access to the components.

Conversion from a portable unit to a stationary pedestal machine suitable for the occasional welding of small components is carried out in a few seconds by mounting the welding head on to the cradle incorporated in the casing, and



Headland "Power-in-Hand" mobile welder

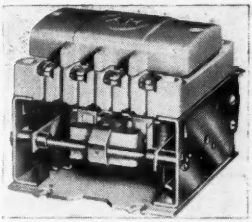
attaching it to the retractable linkage and foot pedal provided. When a small production run is required it is recommended that water cooled arms (provided as an extra) should be used.

A standard machine for use on a 400 V single-phase, 50 c/s a.c. mains costs £136, while a universal machine for 200/220/230/250 V or 380/400/440 V single-phase, 50 c/s mains, adaptable by interchanging links to the transformer primary, costs £10 more. The price of the claw weld attachment is £3 15s. A built-in capacitor, reducing the nominal rating to 10 kVA, gives power factor correction to 0·9.

Contactor Gear

ARROW ELECTRIC SWITCHES, LTD., Hanger Lane, Ealing, London, W.5, announce that they are now in production with a new range

Arrow 25 A type RA contactor



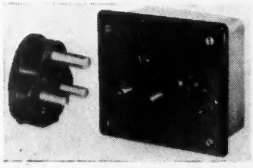
of contactor gear (type RA) to the latest designs of their American associate company. It is claimed that these contactors embody many exclusive features, including a 50 per cent saving in space compared with conventional types, and a free-floating magnet with guided contact alignment. Ratings of 25, 50 and 100 A are available and the contactors can be supplied with or without enclosures. The 25 A size measures 3½in by 3½in by 3¼in.

Fan Heater

COLLARO, LTD., Ripple Works, By-pass Road, Barking, announces the re-introduction of its portable fan heater. Standing 16in high, and with an overall bowl diameter of 12in, it provides at will either a warm or cool current of air reaching every corner of the room. Shutters, controlled by a knob, regulate the direction of the air current, prevent draughts and provide protection from the heater and fan blades. The loading of the heater is approximately 1,500 W, while that of the fan alone is negligible. Available in either cream or eau de nil, the appliance costs £6 1s (plus £3 17s purchase tax in the United Kingdom).

Switch Socket Outlet and Plug

As an extension to its range of "Mutac" silent a.c. accessories, the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has introduced a flush pattern 15 A three-pin switch socket outlet and plug fitted in a shallow cast-iron box. The single-pole switch is mounted separately from the shuttered socket outlet, which has a porcelain body and moulded shutter. The switch and socket outlet are fitted to a 4⅛in by 3¼in brown moulded front plate. The cast-iron box has an external depth of 1½in and is drilled and tapped for ¾in conduit entry in the centre of one long side. Standard units are supplied with finger shield plugs.



G.E.C. "Mutac" three-pin 15 A switch socket outlet and plug

Economy in Building

Proposals Relating to Installation Work

TOWARDS the end of last year an investigation was begun into the possibilities of increased economy in the use of materials in buildings and works carried out under Government Departments. As a result, the heads of the Works Directorates of the Service Departments and the Ministry of Works have produced a report on the subject—"Economy of Building Materials" (H.M. Stationery Office, price 2s). It is considered that the recommendations made can be applied beyond Government work in varying degree to all building and allied work carried out during the present period when economy is important.

The report is in six sections, one of which covers mechanical and electrical engineering. The sub-committee dealing with this was asked to review measures to secure economies (*a*) by revised designs and methods of construction and (*b*) by the lowering of standards. It is said that although certain economies may be made in the field of mechanical and electrical services in Government buildings and installations these services do not offer so much scope for saving in materials as other branches of engineering.

Equipment Design

Plant and equipment of a special character is designed and specified in detail by the Departments' own engineers with full appreciation of the need for economy. Where plant and equipment is of a commercial character its nature is largely outside Departmental control but it is thought that sufficient inducements exist to secure economy and it is neither practicable nor desirable to attempt the production of substandard equipment. It is in the case of raw materials for installations, bought to specifications in general use, that any significant economy must be sought; these account for between a quarter and a third of the Departments' expenditure upon this class of work.

In considering lower standards, certain statutory obligations have to be observed and the sub-committee does not recommend any change in the standards of service to be rendered by an installation, e.g., warmth from a heating installation or lighting intensity from a lighting installation.

As regards the quality of the installation as affecting life and maintenance, some economies can be made without encountering statutory difficulties. Others require amendments to the I.E.E. Regulations for the Electrical Equipment of Buildings. It will not in any case be possible to adhere to recommendations of the post-war series of Codes of Practice and attention is already being called to this by an addendum slip now inserted in new copies of the Codes.

Cable Ratings

For internal electrical installations it is recommended that no allowance should be made for completely unknown future loads and advantage should be taken of the full ratings of cables and switchgear. Increased ratings for v.r.i. cables, in accordance with the "Recommended War Emergency Relaxation of the Regulations for the Electrical Equipment of Buildings—11th Edition" published in 1942 should be promulgated by the I.E.E. It is claimed that this would promote a "nation wide" economy in copper to the extent of 20 per cent of that used in internal cabling.

Although v.r.i. cables in heavy gauge screwed conduit form the most economical system of wiring in permanent buildings, having regard to life and facility of maintenance, in the present shortage of conduit it should be used only where necessary for technical reasons. In domestic buildings, in particular, whether permanent or temporary, t.r.s. or p.v.c. covered cable may be used, enclosed in short lengths of tube only where buried in plaster or liable to mechanical damage. Consideration should be given to the use of grid suspension and similar systems in appropriate circumstances. These relaxations are expected to produce a saving of 20 per cent in steel conduit.

For external electrical services armoured

cable should be used only for supplying operational loads. Overhead distribution should be employed for small supplies to domestic accommodation in temporary buildings. The use of alternative materials, such as aluminium instead of lead in cables and cast iron instead of steel for feeder pillars, should be encouraged. Telephone and control cables are operationally vital and if not armoured should be ducted. T.r.s. cable laid direct in the ground should be used for airfield lighting systems to save 600 tons of lead a year.

Moderate standards should be used for street lighting on sites and the minimum number of routes classified as traffic routes with a higher standard of lighting.

In heating and ventilating systems, design offices should use the full rating of all plant, boilers, pipes and equipment; no spare distribution capacity should be allowed. The Ministry of Housing and Local Government should be asked to consider revision of its model bye-laws to permit economy in the selection of pipe gauges.

At some risk of more difficult operation, economy should be effected by the use of the minimum of fittings, valves, mountings, meters and switchgear.

Ferranti's American Contract

Reasons for Acceptance

IN view of the interest created by the success of Ferranti, Ltd., in securing a contract for nine large transformers from the United States Army Corps of Engineers it is worth while placing some particulars on record.

The contract covers the supply and delivery to the Garrison Dam project at Riverdale, North Dakota, of nine single-phase 13·2/230 kV 33,333 kVA generator transformers, with water-cooled, forced-oil circulation forming three-phase 100,000 kVA banks, each bank connected to the 13·8 kV output of one 80,000 kVA hydro-electric generator with a maximum continuous rating of 97,800 kVA. The installed weight of each transformer will be about 90 tons.

The offer was made on behalf of Ferranti, Ltd., Hollinwood, Lancs, by their subsidiary, Ferranti Electric Inc. of New York for transformers completely responsive to the specification issued. The conditions of contract established for the inquiry were accepted in full.

The Ferranti bid was $887,000 and the lowest American offer was $1,063,100, making Ferranti's the lowest tender by $176,100, although the price included $85,100 duty. As this duty is returned to the United States Government (the purchasers in this instance) it was pointed out that there was a possible saving to the Government of $261,200 (over £90,000).

Although there is a "Buy-American" Act, the United States Army is required, where a foreign offer is strictly in accordance with the specification and is at least $5,000 below the lowest American tender, to refer the matter to the Secretary of the Army for him to decide, taking all other relevant facts into consideration, whether the price difference is great enough to cause him to give instructions for the placing of the order overseas. Under the provisions of the "Buy American" Act, he is authorized to do this, at his discretion, if he considers the American price, by comparison, to be "unreasonable" and therefore "not in the public interest."

After discussions, the matter was referred to the Secretary of the Army and the Ferranti case was presented to him. In addition to stressing the price difference and the complete compliance with the invitation to supply, it was pointed out that the bid constituted a vitally important attempt to help the United Kingdom to earn the dollar exchange necessary in order to enable her to pay for the substantial quantities of food and raw materials which have to be imported from dollar sources and for the defence programme.

From the point of view of after-sales service, attention was drawn to the factory in Canada of Ferranti Electric, Ltd., Toronto, with a staff of competent engineers, thoroughly familiar with the design and

manufacturing practice of Ferranti, Ltd., and themselves regularly manufacturing power transformers.

The technical competence of Ferranti's was supported by referring to their long experience. Mention was also made of their having 33 transformers for 220 kV and above at present in manufacture, all for installation overseas, including seven transformers very similar to the Garrison Dam units for installation in British Columbia by the Aluminium Company of Canada.

The case, on these lines, was presented to the Assistant Secretary of the Army on 2nd June. After asking for an extension of the validity of the offer until 19th July to permit of a thorough examination of the points at issue, it was announced on 18th July that the whole of the contract had been awarded to Ferranti, Ltd.

It is hoped that it will be possible to load the transformers at Manchester Docks and ship them via the Manchester Ship Canal, across the Atlantic Ocean, up the St. Lawrence River through Lakes Ontario, Erie and Huron to Sault St. Marie and thence by rail to Bismarck, to the site. If suitable unloading facilities can be provided, the Lakes journey will be continued through Lake Superior to Duluth, Minnesota.

Garrison Dam is on the Missouri River, about 77 river miles north of Bismarck in North Dakota. It is one of a system of multiple purpose reservoirs authorized by a United States Government Flood Control Act in 1944 and is being constructed to deal with the flood waters of the Upper Missouri River for irrigation, power development, flood control and the improvement of navigation on the Missouri and Mississippi Rivers.

It is claimed that Garrison Dam will be the largest rolled-filled earth embankment in the world. It will be over two miles long and more than 200ft above the bed of the stream. It will carry two re-located main highways (Nos. 8 and 28). It will capture the waters of the Missouri River which is formed by the junction of the Jefferson, Madison and Gallatin Rivers at Three Forks, Montana. The Missouri flows eastwards until it is joined by the Yellowstone River. The augmented river then flows to the dam site where a reservoir is formed, 200 miles long, over 14 miles wide at some points and over 200ft deep along the former river channel, upstream from the dam. The shore line of the reservoir will be approximately 1,500 miles. An ultimate total installed generating capacity of 400,000 kW is planned.

The Peruvian Market

THE use of electricity in Peru has developed so considerably that existing power plants have become quite inadequate to supply the demand. New hydro-electric installations are in course of construction and others are being planned. In his report on the economic and commercial conditions in Peru (H.M. Stationery Office, 3s 6d net), Mr. D. M. Gordon, Second Secretary (Commercial), British Embassy, Lima, says that imports of electrical equipment in 1950 amounted to 6,500 tons with a value of soles 167 million (42·88 soles = £). In 1948 the value of electrical imports was soles 57 million, of which soles 6½ million were from the United Kingdom. These included dynamos and motors, transformers, accumulators, batteries, domestic appliances, motors, radio apparatus, cookers, lighting and heating apparatus, refrigerators, telephone equipment, wiring and electrical accessories of all kinds.

The potential hydro-electric resources of Peru are equivalent to 6,400,000 h.p. Little of this has so far been exploited and much is in areas difficult of access. In 1947, the last year for which figures are available, the total installed capacity was 205,000 kW, of which two-thirds was accounted for by hydro-electric plants and one-third by thermal plants. Lima accounted for 40 per cent of the total consumption. There were 592 plants, a few of them being of medium size supplying Lima and various mining and industrial enterprises, and a large number of small installations, generally diesel-electric, supplying provincial towns, individual mines and farms.

An Electric Watch

AN electro-mechanical wrist watch movement has been developed by the L.I.P. Co. of Paris. The volume occupied by the mechanism is 400 cu mm and the system is maintained in oscillation by a primary battery cell of 700 cu mm volume. The watch has been under test for the past three years at the National Chronometrical Observatory at Besançon.

Commerce and Industry

Denationalization of Iron and Steel

Transformers for Cuba

THE Government's plans for denationalization of the iron and steel industry are outlined in a White Paper (Cmd. 8619, Stationery Office, 4d). A board is to be set up to supervise the industry, including capital development and the distribution of raw materials, with powers to fix maximum prices. It is proposed to dissolve the Iron and Steel Corporation and to set up a Holding and Realization Agency to sell the nationalized companies to private owners. All steel producing companies and all companies processing iron and steel to produce the raw material for metal-using industries will come under public supervision but not steel-using industries and metal merchants. A Bill for the reorganization of the industry is to be introduced early next session.

Gauge and Tool Makers

The annual general meeting of the Gauge and Tool Makers' Association will be held on 29th September at the Savoy Hotel, London, and will be preceded by a luncheon for members only.

Agricultural Shows

The Eastern Electricity Board has taken part in the main agricultural shows in its area, and its display of horticultural plant, dairy apparatus and domestic electrical appliances has aroused wide interest. The Board has exhibited at the Bedfordshire, Essex, Hertfordshire, Peterborough, Royal Norfolk and Suffolk Shows. Its display of domestic appliances is shown in the accompanying picture.

The neon "Safe Hands" sign mounted above the fascia of the E.C.A. Tunbridge Wells Branch Stand, at the Tunbridge Wells and S.E. Counties Agricultural Show on 22nd and 23rd July, was undoubtedly a means of drawing attention to this exhibit. Members of the Branch decided this year to have fewer articles of electrical apparatus on display, cutting out the smaller types and concentrating on the distribution of leaflets publicizing the ideals of and services offered by the E.C.A. members. Arrangements were also made to provide visitors with refreshments.

A display of domestic electrical apparatus which formed part of the exhibit of the Eastern Electricity Board at agricultural shows

Electrical Wholesalers

We have received from the Electrical Wholesalers' Federation, Kingsway House, Kingsway, London, W.C.2, a copy of its latest list of members. This sets out the names of the past-presidents and the members of Council for 1952 and classifies members' names in alphabetical and geographical arrangement.

Illumination Commission Proceedings

The Proceedings of the 12th Session of the International Commission on Illumination held in Stockholm last year have now been published in three volumes. The first volume contains the Secretariat reports (760 pp.), the second volume contains the papers presented at Stockholm (560 pp.), and the third volume contains the reports of the sessions. The price of Volumes 1 and 2 is £2 each and Volume 3 is 17s 6d. These volumes contain the most

recent and complete survey of progress in lighting throughout the world. They are well illustrated and contain more than 2,000 references to books and papers on lighting published since 1948. Orders may be sent to Mr. L. H. McDermott, hon. secretary of the National Illumination Committee at the National Physical Laboratory, Teddington, Middlesex.

Private Trading in Lead

As soon as the necessary arrangements have been made by the Ministry of Materials and the trade the Government is to restore private trading in lead. It is hoped that this will be possible by 1st October. Making the announcement in the House of Lords on Monday, Lord Swinton, Chancellor of the Duchy of Lancaster, said that from the date of reversion the private import of virgin lead would be permitted and the London Metal Exchange would reopen for transactions in lead. The Ministry of Materials would cease to trade in lead except to the extent necessary to wind up its trading operations. Lord Swinton said that supplies of lead in the world were now ample.

Lighting Showrooms

An attractive showroom which illustrates modern lighting practice as applied to stores was opened last week by Courtney Pope (Electrical), Ltd., at the company's works at Amhurst Park, Tottenham, London, N.15. The showroom is unusual in that it has been equipped as an outfitter's store so that the various applications of lighting for particular purposes can be seen under actual conditions. The dimensions of the showroom are not large, but by using mirrored walls an atmosphere of expansiveness is created. Both fluorescent and tungsten lighting are shown, as well as blended light sources, and special types of fittings for restaurants or more exclusive salons are also included.

One of the principal features of the showroom is a Frenger suspended ceiling which combines low temperature radiant heating and acoustic treatment with a flexible system of lighting. The ceiling is made up of a grid piping system supporting perforated square interlocking panels of aluminium and blanketed by insulating material. Square prefabricated pipes form the grid, which is connected to a hot-water system. This ceiling makes for flexibility of lighting, and one of its main advantages is the ease with which patterns of light may be formed on the ceiling, and changed to suit trends in interior design and shop fitting layout.

The lighting units displayed are specially designed with the same type of interlocking panel connections as the standard flat panels, and are made the same size as the panel so that they can replace one panel, or multiples of the panel. With the smaller recessed units, a circular hole is easily cut into a standard panel. The ceiling covers a multitude of service installations, such as sprinklers, Lamson tubes, electric wiring, etc., and to renew the wiring, or alter the switching, is a simple matter.

New lighting showroom of Courtney Pope (Electrical), Ltd.

New G.E.C. Works

The G.E.C., which already has an interest in a production unit at Portsmouth, has been discussing with the Corporation officials for some months past the possibility of extending its light engineering and electronic manufacturing facilities in this area. It is now expected that it will open some new factories within a year or so, and these will take care of high priority work and give badly needed employment, both now and in normal times, to several hundreds of people in the area.

Dry Colouring Process

A demonstration of dry colouring of polystyrene moulding crystals by the Lustrex "Colourant Blend" process was given this week by Monsanto Chemicals, Ltd., at their Fulmer Hall Research Laboratories at Fulmer, Bucks. "Colourant Blend" is crystal clear Lustrex

polystyrene designed for colouring by the user in simple apparatus, the material being then ready for injection moulding with no intermediate processing. The basic idea is not new but because of the difficulties most moulders have been content to leave colouring to the polymer manufacturer.

A.S.E.E. Lecture

The North London Branch of the Association of Supervising Electrical Engineers is holding a meeting on 6th August at 8.15 p.m., at the Three Jolly Butchers Hotel, Wood Green, N.22, at which Mr. W. F. Parker will give an illustrated lecture on "Modern Installations in Large Buildings."

Scottish Lighting Equipment Agreement

An agreement has been reached between the Electrical Contractors' Association of Scotland and Thorn Electrical Industries, Ltd., and Ekco-Ensign Electric, Ltd., under which the rights of the electrical contractor as the legitimate distribution channel for the supply of lamps and lighting equipment to "users" in Scotland are recognized. In appreciation of concessions made by the two companies the E.C.A. of Scotland has undertaken to co-operate as closely as possible with them. All the facilities of the Atlas/Ekco-Ensign sales organizations and their research and production resources are to be made available to members of the Association who will seek by all legitimate means to promote and extend the sale of the lighting products of the two manufacturers. It is expected that the new arrangement will also be of great benefit to wholesalers.

Industrial Drying

The Department of Scientific and Industrial Research has published "Bibliography of Industrial Drying" (price £1 7s 6d, by post £1 8s 7d). The bibliography covers the period 1924–50 and its 800 pages carry some 4,500 entries. The first two sections of the work deal with principles, processes and equipment, and include a limited number of references on heat transfer and drying of gases. A further three sections cover the various drying methods that can be used in agriculture, in the food processing industry and in the drying of industrial materials. Each section is divided by subheadings under which the references are listed alphabetically. The bibliography can be obtained only from the D.S.I.R., Technical Information and Documents Unit, Cunard Buildings, Regent Street, London, S.W.1.

Car Battery Showcard

The attractive new showcard shown in the accompanying picture is printed in nine colours and is the latest addition to the range of Exide car battery showcards available from the company's service agents to their trade customers. It measures 26in by 21¼in overall, is cut out and mounted on strong board.

New Exide car battery showcard

Victorian Commission's Contracts

Largely because of a restricted financial allocation from the State, the Electricity Commission of Victoria is seeking to defer for twelve months payment of contracts totalling nearly £10 million, says the *Financial Times*. Of these contracts about £6 million are with Australian manufacturers and the remainder abroad.

Some manufacturers say that they may be forced to take legal action if payments are withheld. Failing payment there would be widespread retrenchment within the industry. In some cases the Commission wants to defer contracts in addition to payments.

Transformers for Cuba

Sixteen large power transformers which will earn $50,000 for Britain were despatched last week from the Blackwood (Mon.) factory of South Wales Switchgear, Ltd., to Cuba. Mr. A. J. Nicholas, director and general manager of the company, told the Press that the Cuban order was a result of his visit to the United States last year. With American firms fully booked up with orders the Cuban purchasers were told that British firms should be given the opportunity to earn dollars. As a result of the first order being passed by the American inspectors here, further orders have been received.

The transformers have been specially designed to conform with American practice. In spite of the additional work on development and design involving large drawing office expenditure the firm has kept its promise on delivery and the whole contract has been completed since the beginning of the year.

About half the business of South Wales

Switchgear is with overseas markets. Large orders have been received from Canada, mainly for industrial development, two of the biggest being for plant for mines and paper mills. Exports to South Africa are growing rapidly. These include a 33 kV switchgear contract for Port Elizabeth—the first of its kind to be sent abroad from the South Wales company, and the volume of Australian business is increasing. The company is now erecting one of the largest switchgear and transformer contracts ever placed by Pakistan, the order being worth about £250,000. An extension for this plant is now under construction at the factory.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £157 0s 0d
COPPER, H.C. Electro	ton £287 0s 0d
Fire Refined 99·70 per cent	ton £284 0s 0d
Fire Refined 99·50 per cent	ton £276 0s 0d
COPPER Tubes	lb 2s 8⅝d
Sheet	ton £344 0s 0d
H.C. wire and strip	ton £320 0s 0d
LEAD, English	ton £132 10s 0d
Foreign	ton £131 0s 0d
MERCURY	flask £65 10s 0d
TIN	ton £967 0s 0d
ZINC, G.O.B. Foreign	ton £130 0s 0d
Electrolytic	ton £134 0s 0d
BRASS Tubes	lb 2s 3⅜d
Sheet	lb 2s 6½d
Wire	lb 2s 9½d
PHOSPHOR BRONZE	
Wire	lb 4s 1⅞d
RUBBER, No. 1 R.S.S. spot	lb 26¾–27d

Changes of Name

The V. G. Manufacturing Co., Ltd., has changed its name to the V. G. Porcelain Co., Ltd.

R. D. Cardiff, Ltd., has changed its name to Ardecar, Ltd.

Change of Address

As from 11th August the offices of the London divisional accountant's staff of the British Electricity Authority will be transferred to Clifton House, Euston Road, N.W.1 (telephone : Euston 2838).

Trade Announcements

The telephone number of **Stewart Transformers, Ltd.**, 75, Kilburn Lane, Kensal Rise, London, W.10, has been changed to Ladbroke 2296-7.

The address of the London office of **Britannia Batteries, Ltd.**, is now 53, Victoria Street, S.W.1 (telephone : Abbey 6168-9; telegraphic address : "Britanicus," Sowest, London).

The London office of the **D.P. Battery Co., Ltd.**, has been transferred to 66, Victoria Street, London, S.W.1 (telephone : Victoria 9661-2).

Annual Holidays

The works and offices of Micramatic, Ltd., will be closed from 16th to 24th August.

The sales office and works of Aidas Electric, Ltd., will be closed from 1st to 16th August inclusive, during which period the company will be unable to dispatch orders or accept deliveries.

The works of the Electroplant Co. will be closed until 12th August.

The works of Dorman & Smith, Ltd., will be closed from 2nd August until 16th August.

Catalogues and Lists

Sloan Electrical Co., Ltd., Slonetric House, 31-33, Bondway, London, S.W.8.—Priced catalogue of Reyrolle industrial and domestic plugs and sockets, switch-fuse and plug units, etc.

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London, W.C.2.—Technical brochure describing the Standard-Sunbury electronic engine indicator.

Lincoln Electric Co., Ltd., Welwyn Garden City, Herts.—Comprehensive technical brochure setting out the physical properties and detailed welding procedure for all the company's welding electrodes.

Dexray Engineering Co., Ltd., Brock Street, Lees Street, Manchester, 1.—Lighting fittings catalogue (LF.3).

Carter Gears, Ltd., Thornbury Road, Bradford, Yorks.—Illustrated folder giving details of f.h.p. infinitely variable speed gears (CJ.2).

Electromagnets, Ltd., Boxmag Works, Bond Street, Birmingham, 19.—Illustrated leaflet giving technical details of their recently developed magnetic conveyor head unit (62).

Eltron (London), Ltd., Accrington Works, Strathmore Road, Croydon, Surrey.—Illustrated catalogue of industrial heating elements (List 52).

Arcolectric Switches, Ltd., Central Avenue, West Molesey, Surrey.—Booklet illustrating latest range of signal lampholders, lamps and switches with price list (127).

Wandsworth Electrical Manufacturing Co., Ltd., 32, Frederick Street, Birmingham, 1.—Illustrated priced catalogue dealing with mercury switches and switch units for use in hospital operating theatres (F.13).

G. M. Engineering (Ottery St. Mary), Ltd., 1, Victoria Street, London, S.W.1.—Two technical publications dealing with oil circuit breakers (OCB.971) and metalclad switchgear (SB.971).

Engineering in Europe

Survey of Current Literature

TESTS made in Germany to determine the conditions of a 100 kV power line with suspension insulators when all but a single span have dropped their ice loads (required height above ground of the line must obviously be maintained even in this case) also enabled experimental data for simplified calculation of tensions and sags to be collected and evaluated. The line was a duplex one of 150 mm² pure Al conductors and the measurements were carried out on two spans of 1,351 and 2,202 m length, respectively. The additional loads applied were steel ropes clamped on the conductors at spacings of 20 m. Temperatures, swings of insulator chains and sags were measured before and after applying the additional loads. The measured sags were reduced to a temperature of −5 deg C. The results were tabulated and graphed on the following principles: distribution of tensions in the spans investigated for various additional loads and chain lengths; relation between the tensions in the loaded and the adjacent spans, and the additional loads; tension in the loaded span *v.* additional load, span length and chain length. The predetermination of sags from the tabulations and curves obtained is then easy although applicable only to this particular conductor material.—"A Contribution to the Determination of Tension and Sag in a Sagging Span (Evaluation of Tests on a 100 kV Line)," W. Furkert, *Elektrotechnik*, Vol. 6, No. 4, pp. 170–175, April, 1952, in German.

Line Clamps and Joints

The regulations for current-carrying line connectors and clamps limit the maximum temperature which these elements may reach to 40 deg C (which is the value prescribed for the conductors) and also require them to be safe for short-circuit currents. The first of these conditions implies that the contact voltage at a joint must not be greater than the resistance of a corresponding length of conductor, which is equivalent to excluding any additional losses, such as those due to skin effect, or eddy currents, etc. Even if this condition is satisfied (contact resistance as a whole low enough) it will not automatically guarantee short-circuit safety, because a single localized bad contact somewhere inside the joint will, on short-circuit, become an instantaneous source of much heat that cannot be dissipated quickly; scorching of the joint will be the result. These considerations apply particularly to aluminium and composite conductors. The author reports comprehensive investigations of joints and clamps, yielding relations between mechanical and electrical characteristics, e.g. contact pressure and area, conductor and clamp deformation on one hand, and skin or contact resistance on the other hand. The influence of the conductor materials and of their oxidation is also clarified. The solution of the problem is a question not only of the choice of the most suitable materials and designs, but also one of maintenance, which is the more difficult part of it.—"Contact Voltages on Clamps and Joints of Overhead Lines," H. Schoenberg, *Elektrotechnik*, Vol. 6, No. 3, pp. 115–118, March, 1952, in German.

Flashover Stress

The breakdown-stress of air on the surface of two cylindrical conductors may be calculated by a fairly involved formula which for $d > 5\ r$ (d spacing of the axes of the conductors, r conductor radius) simplifies to the approximate expression $E = U/(2r \log d/r)$ in which case the error is $\pm 2{\cdot}5$ per cent (U being the p.d. between the conductors). The flashover voltage may only be calculated in a range where the critical disruptive voltage coincides with the sparkover voltage, that is where there are no predischarges. This range comprises ratios $\frac{d}{r} < 30$ for conductor diameters > 1 mm. The breakdown voltage is inversely proportional to the

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

absolute temperature (between − 30 deg C and + 30 deg C). For sparking distance $a < 2$ mm it increases strongly, whatever the conductor diameter, and is not representable by a theoretical formula. For $a > 2$ mm the critical disruptive voltage is independent of a, but depends on the conductor diameter. For 3 mm conductor diameter the breakdown voltage is 36 kV/cm and decreases for increasing conductor diameters and approaches asymptotically the theoretical value of the breakdown stress of air, viz. 21 kV/cm for a conductor diameter of 200 mm, which then holds for all larger diameters. The curves of field strengths plotted from the results of the author's measurements enable the flashover voltages for parallel and crossed conductors to be calculated from diameters of 2·5 mm onward (except for sparking distances < 2 mm).—"The Flashover Voltage between Cylindrical Conductors in Air," W. Pankow, *Elektrotechnik*, Vol. 6, No. 3, pp. 109–113, March, 1952, in German.

Commutator Losses

The author presents a critical review of data collected from the international literature on the subject. The various formulæ are compared with each other and with a large number of empirical data; it is seen that Hayes's empirical factors agree very well with Contin's formula, on one hand, and with the data of the Electrical Engineer's Handbook 1947 and Mathieu's textbook 1949, on the other hand. They apply to long commutators. For short commutators, Hayes's and Contin's results agree better with those obtained by Livshits. The author presents a comparative table of the permissible surface loading of commutators for various peripheral speeds and a maximum temperature of 60 deg C, with safe mean values derived from all available sources. A graph is based on these mean values and its use for the design of a commutator is shown by a numerical example. The author points out that the uncertainty of the calculations is introduced by the erroneous assumption of the constancy of the contact voltage drop and that the heat exchange coefficient, surface conductivity and other essential factors are known only empirically, i.e. from measurements on existing machines, and cannot therefore be predetermined accurately for new designs. An appendix gives a simple formula for determining the brush pressure (first published by the National Carbon Co.).—"Losses and Temperature Rise of Commutators," M. Markov, *Elektrotechnicky Obzor*, Vol. 41, pp. 35–38, No. 1, 1952, in Czech.

Ionization in Transformers

The purpose of this report on a series of experiments in fault detection on a 1·7 kVA, 120/5,000 V, 8·2/0·21 A transformer lifted out of its tank was to establish the relative merits of a number of possible circuits for detecting insulation defects and to show how they affect the measured results. The indicating set-up, consisting of a transformer-coupled valve circuit called a "derivator," and the indicating instrument (valve-voltmeter, Despretz galvanometer, or c.r. oscillograph) was always the same.

Logically, the fault, simulated by a spark-gap and series capacitor shunted across several turns of one winding and a similar arrangement between the same winding and the tank, was also left unaltered throughout the experiments. What were changed were the connections between the free ends of the h.v. winding (on which the fault was simulated) when the l.v. winding was energized with voltages rising from 0 to 150 V. The changes of the connections consisted in earthing, or connecting to the tank, alternative points of the h.v. winding.

The graphed measurement results show that the onset of ionization can always be detected with some precision and thus the presence of soft spots in the insulation revealed. The most reliable indications are those obtained in one of the circuits with one phase connected to earth, or to the tank, and the measuring set-up connected between tank and earth.—"Detection of Ionization Processes in Transformers," B. Heller and A. Veverka, *Elektrotechnicky Obzor*, Vol. 41, No. 1, pp. 17–22, 1952, in Czech.

Swedish Automatic Telephony

THE automatic switching of long-distance connections on the Swedish telephone network is rapidly progressing. By the end of next year complete automatization between Stockholm and several major cities within a distance of some 100–150 miles will be in operation. Full automatic working will, when concluded, span distances of up to 1,000 miles. Certain adjustments in the telephone tariff will result in savings to the subscribers.

ELECTRICITY SUPPLY

Speedier Rural Electrification Urged

Route of 275 kV Line Opposed

THE Midlands Electricity Consultative Council, in a resolution passed at its meeting last week, expressed the opinion that the strongest representations should be made to the Central Authority and the Minister of Fuel and Power for a substantial increase in the allotment of capital expenditure for rural development. The Rev. R. A. Giles said that the trouble lay with the Treasury. They had been told that funds remaining for the whole of Shropshire and Herefordshire were £1,400. The chairman, Ald. H. Leason, pointed out that they could not bring people on to the land to increase food production unless the rural areas had electricity.

Non-Remunerative Rural Supplies

At a Belfast Press conference last week Sir William Robinson, chairman of the Electricity Board for Northern Ireland, said that the restrictions on capital expenditure imposed by the Imperial Government made it impossible for the Board to proceed with further large development schemes. He also reported on the Board's experience with rural electrification since it was prohibited from requiring guarantees of minimum consumption or contributions to capital costs except as determined by a Government-appointed referee. Sir William said that in 1950 and 1951 the Board had spent £1,444,386 (against an estimate of £900,000 made in 1949). On this a return of only 8 per cent was being received which was quite inadequate to meet the charges involved.

Mr. A. W. Ferguson, chief administrative officer of the Board, stated that only 36 per cent of the farms connected were using power for farming purposes; the remainder required it for domestic uses only. But even if farmers were to make the fullest possible use of the supply there would still be a loss on rural electrification.

Lighting of Pedestrian Crossings

The Ministry of Transport has indicated to local authorities that the installation of flashing lights to mark pedestrian crossings should be brought into effect as far as possible by next winter. Reporting on this, the Stoke Newington Highways Committee says it is expected that the lighting of the beacons will eventually be made compulsory. According to a preliminary estimate by the Ministry, the cost of installing two beacons at a crossing will be about £40 and maintenance costs are expected to amount to some £12 a year. The Committee has recommended the installation of such equipment in the borough at an estimated cost of £1,300, with maintenance costs of £780, towards which Ministry grants of £880 and £528 respectively are expected to be paid.

Alternative Supply Sought

During a recent storm a breakdown occurred in the electricity supply at Llandovery. This was referred to at the last meeting of the Council when it was stated that a serious aspect was the fact that the water supply was dependent on electricity. The Council decided to ask the South Wales Electricity Board to lay an alternative cable.

Dearer Electricity in Israel

Electricity charges to domestic consumers in Israel, which were increased by 50 per cent in March, have been raised a further 45 per cent. Rates for industrial supplies are advanced 40 per cent and for irrigation by 25 per cent.

Sewage Pumping Plant

Coventry Corporation is recommended by the city engineer to replace the existing pumps at the Baginton sewage pumping station by three electrically operated centrifugal pumps at an estimated cost of £5,450 including installation and ancillary work. It is estimated that the operational costs would thus be reduced from £14,550 to £7,480 per annum.

Objections to 275 kV Line

It is understood that 90 per cent of the farmers and landowners in the South Tyne area over whose land the 275 kV overhead line from Stella (Newcastle-on-Tyne) to Carlisle will pass have decided not to grant the necessary wayleaves. The Minister of Fuel and Power (Mr. G. Lloyd) in a letter to Mr. R. Speir, M.P. for Hexham, stated that if wayleaves could not be obtained, the route might have to be revised, but it would not be possible to make major alterations to the proposed route. The British Electricity Authority might, however, seek compulsory powers. Ramblers, cyclists and youth hostels' associations in the North-East have added their protest against the

proposed line on the grounds that the Government had not been impartial in the matter, the public inquiry into the matter having been heard by an electrical engineer who was a servant of the Ministry of Fuel and Power.

Mr. Speir recently had an interview with Lord Citrine, chairman of the B.E.A., regarding the siting of the 275 kV overhead line. Lord Citrine agreed to take up with the B.E.A. officials a suggestion that instead of passing through the parishes of Newbrough and Fourstones the route of the line should be a mile farther north.

Liverpool Lighting Charges

The Merseyside and North Wales Electricity Board proposes to make a charge of approximately £10 per service for the provision of a supply to public lamps. At last week's meeting of the Liverpool City Lighting Committee it was stated that on that basis it would cost about £120,000 to convert the existing gas lamps. The Committee had before it a report which stated that Liverpool might be alone in protesting against this proposed service line charge for neighbouring authorities had been paying a similar charge for many years. The Electricity Board intimated its willingness to modify the proposed charge if the Corporation was prepared to pay a higher tariff for electricity used, but said that it must recover its costs in some way.

Financing Mexican Development

The Federal Electrical Commission in Mexico will soon have at its disposal the $29·7 million in credits granted by the International Reconstruction and Finance Bank in Washington through the Nacional Financiera, the semi-official government finance agency. The terms of the loan do not make any stipulations as to how or where the funds are to be spent. This sum is part of an original sum of $150 million authorized by the Export-Import Bank in August, 1950, to aid Mexico's vast development programme which, apart from electrification, covers railroads, metal industries, telecommunications, etc.

Petition for Electricity

Whitby Rural District Council has decided to support a petition by 34 families asking for an electricity supply in the Esk Valley. It is stated that a line passes within 50 yards of the houses, yet the inhabitants still have to use oil lamps for lighting.

Aberdeen Floodlighting

Aberdeen Town Council has decided to spend £1,820 on movable floodlighting equipment. A church, a theatre, a public library, a church spire and towers have been selected for the "preview" in the early autumn. Decorative lighting will also be installed at the sea beach, but a proposal to transform Union Terrace Gardens into a fairyland of coloured Chinese lanterns and illuminated rabbits, owls and squirrels has been postponed.

Extensions Delayed

The Eastern Electricity Consultative Council recently received a report from its General Purposes Committee that consideration had been given to representations from the Depwade R.D.C. concerning the number of approvals from Government and other authorities which the Electricity Board had to obtain before it could proceed with the provision of supplies to new consumers. The Committee, which had had a preliminary but detailed reply from the Board, recommended that in view of the important nature of the questions raised, consideration of the matter should be deferred until the next meeting and this was agreed to.

Supply to Police Houses

A report submitted to the North Riding County Council expresses concern at the large sums demanded by the North Eastern Electricity Board before electric mains are extended to new police houses. The County Council is seeking the assistance of the Home Secretary in the matter.

Mains Extensions

Douglas (I.O.M.) Corporation Electricity Committee has approved a plan submitted by the borough electrical engineer for mains extensions covering Scheme 111 on the Willaston estate, and has been authorized to carry out the work at an estimated cost of £11,000.

House Installations

Tenants of 116 Council houses on various estates at Spalding have asked for electricity to be installed and a scheme is being considered by the Urban District Council.

Civic Centre Installation

Gateshead Town Council has decided to employ direct labour on the electrical installation (estimated to cost £7,427) at the new civic centre being erected at Shipcote, Gateshead.

Progress at Wairakei

Drilling will soon start at Wairakei, New Zealand, to see whether a 20,000 kW commercial geo-thermal generating plant can be set up there as an initial development. The first of three big drills from America was due at Auckland on 11th July.

Dock Lighting

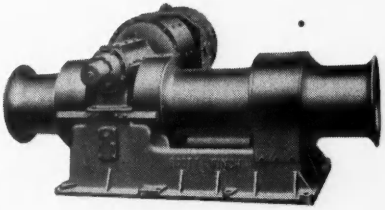
Bristol Dock Committee is to improve the lighting of the wharves, quays and railway sidings at Avonmouth Docks.

Improved Cargo Winch

Elimination of Mechanical Braking

THE latest development of the regenerative type of winch introduced about six years ago by Laurence, Scott & Electromotors, Ltd., is designed to give maximum speed of hoisting and lowering, compatible with safe and simple control and without the use of friction brakes in ordinary operation. Elimination of brake wear considerably reduces the cost of maintenance. The winch is suitable for direct current operation and the electrical system incorporates electrical braking by regeneration, current being fed back to the line (or absorbed by resistance if there is insufficient external load to take the regenerated current).

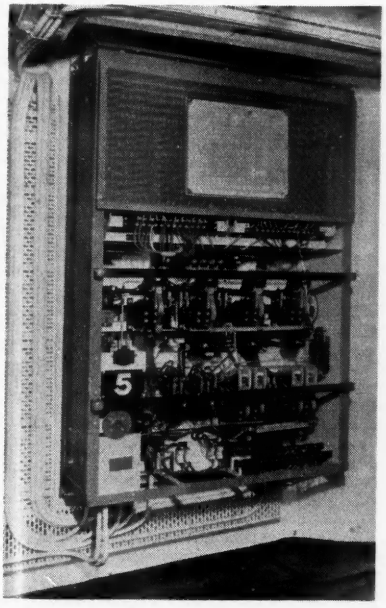
There are four speed steps in either direction, the low speeds being obtained by armature diversion. In the hoisting direction with the controller on the fourth (high speed) step the speed given at full load is about 130 ft/min. If the load is about two-thirds full load or less, the speed



Scott dynamic " Selector " winch

is automatically increased by a load discriminating contactor to about 200 ft/min, and if the load is about half full load or less, a further step of load discrimination increases the speed to about 250 ft/min, rising to 450 ft/min at light hook.

Contactor gear for dynamic " Selector " winch



In the lowering direction on the high speed step the load discriminators automatically limit the speed of lowering to about 450 ft/min up to quarter load, to about 360 ft/min at loads between quarter and half, and to about 250 ft/min at loads between half and full load. Lower speeds can be obtained on other steps down to a landing speed on Step 1 of about 25 ft/min. Smooth and steady braking at all speeds and loads is obtained electrically, no foot brake being fitted. A magnetic brake is provided to hold the load at standstill in the " off " position of the controller and to act as an emergency stop in the event of current failure. On Step 1 the slow landing speed is obtained by pure electrical braking with power cut off the armature circuit and when the load has touched down the winch comes to rest automatically.

The master controller may take the form of a pedestal, suitable for mounting in any convenient position, or may be on top of the winch motor. The contactor gear and resistances are in panel form for deck-house mounting, so giving ease of access for inspection and maintenance under all conditions and the provision of adequate

room for the resistances. The contactors are of unit type construction, with standardized parts.

Current surges due to quick switching are restricted within safe limits on the early steps by electrical lock-outs, and on the later steps by the special design of the motor field circuits which ensures good time-constants. The mechanical construction of the winch is generally similar to that of other Scott winches, except that mechanical brakes are not required for ordinary operation. Worm and worm-wheel gearing ensures silent operation and long life.

The Scott dynamic "Selector" winch, as the new unit is called, is made for normal full loads of 3 or 5 tons and forms one of a wide range of winches of various types, suitable for ships of all classes and for alternating or direct current supply. A series of demonstrations of a 3-ton model was given last week at the L.S.E. Gothic Works at Norwich with various loads ranging from light hook to 5 tons (racking test). Features to which special attention was drawn included touch down, speed control, rapid reversal from "full on" hoist to "full on" lower, controller interlock in case of failure of the electricity supply, and the operation of the emergency stop. On 35ft lifts it was shown how it was possible to lift a full load of 3 tons every 1½ minutes or an overload of 4 tons every 3 minutes.

Following the demonstration of the winch a number of films taken with a special high speed camera (3,000 exposures per second) was shown to indicate the kind of conditions which marine electrical equipment is likely to encounter in time of war and the steps taken by the company to produce a range of control gear components which will function under severe shock conditions. Further indications of the company's efforts in this direction were revealed in a subsequent tour of the works.

Export Policy Needed

SOME of the difficulties which exporters have to face and the need for a long-term export policy were referred to by Mr. Leslie Gamage, president of the Institute of Export, at a luncheon of the Institute held in Birmingham on 22nd July.

Mr. Gamage said that the Institute, while urging the needs of export and putting forward definite plans for dealing with them, never stood for any idea of import restriction, which must compel other nations to follow suit, and could only result in contracting world trade. He criticized the Government's instructions as to where industry should direct its exports. Exports demanded long and constant cultivation of the market. This applied particularly to the engineering industry, from which the bulk of our future exports had to come. The sale of capital goods, such as heavy plant, demanded preliminary spade work by engineers for some two or three years before success could be achieved. Once, however, we were in, it would be sheer folly to let the market go.

Great Britain had now to face keen competition from all manufacturing nations, particularly Germany and Japan, and under such conditions our export trade in high quality goods was only possible if we had a virile and prosperous home market—and that market was at present denied to industry by Government regulations and high purchase tax.

Customers were getting more selective and more critical, and perhaps the most general complaint centred on delivery, particularly in the engineering trades. In the majority of cases failure to keep delivery promises stemmed from lack of labour and from the shortage of raw materials.

Referring to the need for a permanent long-term export policy, Mr. Gamage said that the position of Secretary for Overseas Trade continued to be used as a testing ground for so-called more important posts. How could we get a permanent export policy under such conditions? Exporters would take on the added burden with greater heart if they knew they were working to a plan which would ultimately provide a real solution. Could something be done which would ensure a supply of food and raw materials to us, and at the same time relieve us of a dependence which prevented us from re-assuming the leadership of the world?

It was clear that the United States was not a natural market for the great bulk of our manufactured products. The Empire was our natural market, and Mr. Gamage urged that we should go all out for Empire development and an expansion of inter-Empire trade.

The need for the Institute of Export and for trained men in the export field was greater than ever to-day and would increase as the years went by.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

The General Electric Co., Ltd., is to pay a final dividend for the year ended 31st March, 1952, of 15 per cent actual (3s per £1 unit of stock) on £5,877,720 ordinary stock, less income tax at 9s 6d in the £, absorbing £462,870 net. This, with the interim dividend already paid of 7½ per cent actual on £4,198,372 ordinary stock, less tax at 9s 6d, which absorbed £165,311 net, makes a total distribution of £628,181 net. For the previous year the dividend was 10 per cent and a bonus of 12½ per cent on £4,198,372 ordinary stock (less tax), which absorbed £495,933 net. The aggregate profit of the group before United Kingdom and overseas taxation and proportion attributable to minority shareholders, amounted to £6,603,957 (against £5,651,418 for 1951), and the consolidated net profit attributable to the holding company, after taxation, to £2,091,114 (£1,978,039). United Kingdom taxation, including £200,098 excess profits levy, amounted to £3,785,914 (£3,149,743). £483,674 net profit relating to previous years has been brought into the group profit and loss account, compared with £403,234 in the previous year. The annual general meeting of the company will be held on 25th September.

Broadcast Relay Service, Ltd.—At the annual meeting it was announced that application had been made to the Capital Issues Committee for permission to issue new capital amounting to some £2½ million in debenture stock and ordinary shares which will be utilized to finance the company's development programme and to repay the related bank borrowings. It is intended to issue the ordinary shares to the ordinary stockholders. The chairman, Mr. J. S. Miles, reported that there had again been an increase in the number of Rediffusion subscribers, and operations had been extended into several new areas. The output of electronic equipment by the company's subsidiary, Redifon, Ltd., had once again increased largely as a result of greater exports which currently represented more than one-half of that company's total output. Communication equipment continued to be in general demand. Rediweld, Ltd., had also had a successful year. In overseas areas the growth of Rediffusion and broadcasting business had again been extremely rapid. Valuable experience had been gained from the world television service at Margate and they had also proceeded to erect television networks in other areas, such as Eccles, Birkenhead and Nottingham. They were proposing to erect similar networks in Holloway and Hull.

E. K. Cole, Ltd.—The anuual meeting was held on 24th July, when Mr. E. K. Cole (chairman and managing director) referred to the expansion of the television market by the opening of the North of England and Scottish television transmitters, and the gratifying support by the public for their receivers. They had installed equipment enabling them to produce television sets suitable for American and European systems. Their volume of home television production had enabled them to quote competitive prices in Canada and South America, with the result that they were already in production on one order for television receivers worth more than $1,500,000 and they awaited confirmation of another amounting to $650,000.

The expansion of the electronics division in the production of radar communications and nucleonic equipment for Government services and commercial use continued, and their plastics division increased its turnover. The heating division, which marketed electric space and tubular heaters, was still subject to licensing restrictions and a high rate of purchase tax on its products, and until these conditions were removed expansion must be retarded. They continued to expand in the marine field and further vessels were fitted with "Thermovent" heating equipment. Turnover with overseas countries again reached a new record.

The Morgan Crucible Co., Ltd., reports a group profit for the year ended 31st March last, subject to audit, of £1,966,918, as compared with £1,516,976 for 1950-51. United Kingdom taxation requires £1,014,889, and foreign taxation £86,271. The profit attributable to the holding company is £827,036 (against £586,541). General reserve receives £300,000 and it is proposed to pay a final dividend of 8¾ per cent, making 12½ per cent for the year (unchanged). The balance carried forward is £135,561 (against £142,705 brought in).

Aron Electricity Meter, Ltd., reports a profit for the year to 31st March last of £96,679, as compared with £86,523 for the preceding year. Taxation requires £62,396,

and after adding £5,599 surplus provision for tax in previous years, and £34,811 brought in, the balance available is £74,693. General reserve receives £15,000 and it is proposed to pay a dividend for the year of 15 per cent (unchanged). The balance carried forward is £47,728.

The Revo Electric Co., Ltd., states that in order to reduce the disparity between interim and final distributions, it is proposed to declare an interim dividend of 10 per cent next December. For the past year the total distribution was 27½ per cent, of which 5 per cent was an interim dividend, and 22½ per cent the final distribution, which included a cash bonus of 10 per cent.

Geo. Kent, Ltd., are maintaining their final dividend at 9½ per cent, making 12½ per cent (same) for the year. The profit of the parent company for the year ended 29th March was £122,944 (£144,134), after providing for taxation totalling £103,906, and after crediting £30,000 tax overpaid in previous years.

The Telegraph Construction & Maintenance Co., Ltd., announces that acceptances have been received for over 96 per cent of the rights offered to shareholders in the recent issue of 651,364 ordinary £1 shares at 21s 6d, the balance being taken up by underwriters.

The Electric Furnace Co., Ltd., proposes to pay a final dividend of 5½ per cent, maintaining the distribution for the year at 10 per cent. Subject to audit the group profit, before tax, for the year ended 31st March amounted to £101,000 (£83,054).

The Britannia Electric Lamp Works, Ltd., is again paying a first and final dividend of 12½ per cent. The group profit for the year ended 31st March was £38,745 (£50,356).

Mather & Platt, Ltd., are paying an unchanged interim dividend of 4 per cent.

New Companies

G. F. Hardwick (Lincoln), Ltd.—Registered 18th July. Capital £5,000. Electrical engineers and repairers of and dealers in dynamos, motors, armatures, etc. Directors: G. F. Hardwick (permanent) and Mrs. Phyllis Hardwick. Registered office: 173, Burton Road, Lincoln.

Volex Electrical Products, Ltd.—Registered 22nd July. Capital £100. Merchants, manufacturers, repairers and fitters of electrical appliances, etc. V. H. Boughey is the first director. Secretary: A. Lowe. Registered office: 37, Brown Street, Manchester.

Roma Electrical Supplies, Ltd.—Registered 10th July. Capital £100. Importers and exporters, repairers, manufacturers and dealers in dynamos, motors, armatures, magnetos, batteries, transformers, etc. Subscribers: G. T. Pyle and J. A. Rose. Secretary: Gordon F. Pyle. Regd. office: 519, High Holborn, W.C.1.

Neon Ideas, Ltd.—Registered 12th July. Capital £200. Designers, manufacturers of and dealers in neon signs, etc. Directors: J. F. Aldridge, F. E. Metters and S. G. Ford. Regd. office: Laytons Buildings, 199b, Borough High Street, S.E.1.

Atom Electrics (Northampton), Ltd.—Registered 12th July. Capital £3,000. To acquire the business of an electrical engineer, and dealer in radio and television apparatus carried on by A. R. S. Hawkins, at 50, Kingsthorpe Road and 21, Barrack Road, Northampton, as "Atom Electrics." Directors: A. R. S. Hawkins (chairman) and Mrs. Edith M. Hawkins. Regd. office: 21, Barrack Road, Northampton.

C.B.B.C. Electronic Devices, Ltd.—Registered 12th July. Capital £600. Directors: S. J. Birn, C. Calmon, R. J. Barr and L. Chambers. Regd. office: 26-27, Conduit Street, W.1.

Increases of Capital

Philips Electrical Industries, Ltd.—Increased by £3,000,000, in £1 ordinary shares, beyond the registered capital of £2,500,000. At 23rd April, 1952, the Midland Bank Executor & Trustee Co., Ltd., held 2,499,998 shares out of 2,500,000 issued.

J. W. & C. J. Phillips, Ltd.—Increased by £15,000, in £1 ordinary shares, beyond the registered capital of £15,000.

S. Dickinson, Ltd.—Increased by £25,000, in £1 ordinary shares, beyond the registered capital of £10,000.

Liquidations

Central London Electricity Accessories, Ltd., electrical contractors, 46-47, New Broad Street, London, E.C.2.—Winding up voluntarily. Liquidator, Mr. H. J. Mellows, of above address, appointed 23rd July.

Arpan Engineering Co., Ltd., manufacturers of electrical equipment, 73-75 Mortimer Street, London, W.1.—Liquidator, Mr. D. Morgan, 100, Park Street, London, W.1, appointed by creditors on 15th July.

Bankruptcy

J. G. Milne, radio and electrical dealer, 34, Whitworth Road, Grangetown.—First meeting, 8th August, at the Official Receiver's Office, 4, Bridge Road, Stockton-on-Tees. Public examination, 6th October, at the Court House, Wilson Street West, Middlesbrough.

STOCKS and SHARES

FOREIGN affairs had the effect last week of adding another discouragement to investment, which had already begun to withdraw into its shell on the approach of the current week's Parliamentary debate on economic conditions. Prices generally took a pace backwards, but markets remained quiet and orderly in the face of disturbances which might well have caused something more serious in times when investors were less inured than they are to-day to these combinations of economic and political crises. British Electricity stocks lost further fractions of the recent revival, in company with the rest of the gilt-edged market. In electrical equipment and other industrial shares, declines were neither widespread nor substantial.

G.E.C. Dividend

The General Electric Company's decision to pay a final ordinary dividend of 15 per cent is in accordance with the estimate published in February, at the time of the issue of 1,680,000 new shares at 72s 6d. These rank for the current dividend, so that, although the total of 22½ per cent for the year is at the same rate as before, it involves actually a larger distribution to stockholders. Interim and final dividends for 1951–2 amount in fact to £628,200 net, as against the £496,000 paid for the preceding twelve months. The payment takes this time about one-third of the net surplus profit. Trading profits were up by the best part of a million, but taxation (including £200,000 on account of the excess profits levy) skims off most of the increase. The proposed 100 per cent capital bonus is expected to come up for approval at the time of the meeting in September. On the results, the £1 shares were firm at 79s 6d, showing a yield of £5 13s 3d per cent, which is the appropriate return now from industrials in the "blue-chip" class.

Recent Issues

Henley's Telegraph new ordinary shares, fully paid, now become converted into stock units and rank equally with the older stock in all respects, including rights to the 100 per cent share bonus which the company is about to distribute. At the finish, the new shares were about 1s 9d above the issue price of 14s 6d. For Siemens and Telegraph Construction new ordinary shares, both of which are now fully paid, the last days for the renunciation of allotment letters are respectively the 12th and 6th August. In these cases also, the new will then assume equal rank with the older shares. They will, of course, cease to be free of transfer stamp to the buyer. At the beginning of this week, the Siemens new shares were 3s 6d above the price of 28s at which they were offered, and in the case of T.C. & M., issued at 21s 6d, the premium was 2s 3d.

Broadcast Relay

Broadcast Relay Service's annual report, issued a month ago, drew attention to the consistently successful expansion of the business, and interest in the company's 5s ordinary shares has subsequently been raised by the report of an order worth nearly $3 million from the Royal Canadian Air Force. This contract relates to the subsidiary company, Redifon, which specializes in communication and electronic equipment and the news drew comment on the diversity of the group's interests beyond those implied by its title. It is noted, moreover, that British Electric Traction is substantially interested in the "rediffusion" side of the business, while there is co-operation with E.M.I. in the development of wired television. The company's shares are quoted at about 19s 6d, to yield approximately 7½ per cent gross on the well-covered dividend of 16 per cent tax free paid on the last two years. Treasury consent is being sought for a substantial issue of new permanent capital.

Dollar Contracts

Of the other companies which, like Broadcast Relay, have been in the news lately on account of reported dollar contracts, Ferranti's ordinary shares remain in private hands, public interest being confined to two issues of preference capital. Rumours have in the past circulated through the market concerning an introduction of part of the million 10s ordinary shares, but there is still no general public interest in the equity of this business, which showed in the last balance sheet total net assets approaching £3 million.

Dividends and Results

Oldham & Son's 1s shares were well maintained at 4s 3d on the declaration of the final dividend, which brings the total for the year to 35 per cent. This is 5 per cent more than it was last time, and puts the shares on an 8¼ per cent yield basis. Trading profits have expanded by 18 per cent. In the market there is discussion about the possibility of a capital issue. Aron Electricity Meter £1 ordinary have been marked up to 33s 9d, at which the yield is still relatively high at nearly 8·9 per cent on the 15 per cent dividend just declared. With a single exception, this rate has been paid on the last ten occasions. After increased taxation, the net profit is much as before, and covers the distribution with a wide margin. Dealings are seldom recorded in the 5s shares of Britannia Electric Lamps; the company is again paying a 12½ per cent dividend.

Electrical Investments

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price July 28 1952	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	82	+½	3	13	2
Brit. Elec. 1974/77	3	3	80	—	3	15	0
Brit. Elec. 1976/79	3½	3½	86	—	4	1	7
Brit. Elec. 1974/79	—	4½	99	—	4	5	10
Calcutta Elec. ..	6†	6†	20/6	—	5	17	1†
East African Power	7	7	25/-	—	5	12	0
Nigerian Elec. ..	10	10	21/3	+ 1/6	9	8	2
Palestine Elec. "A"	5†	5†	13/6	—	7	8	2†
Perak Hydro-Elec.	Nil	Nil	12/-	+6d		Nil	
Equipment and Manufacturing							
Aberdare Cables (5/-)	20	20	11/-	—	9	1	10
Aerialite (1/-) ..	83½	88½	7/3	—	12	4	0
Aron Elec. Ord. ..	15	15	33/9	+ 1/6	8	17	9
Assoc. Elec. Ord. ..	20	20	69/6	—	5	15	2
Automatic Tel. & El.	15	15	55/-	—	5	9	1
Babcock & Wilcox	18	18	63/9	—	5	12	10
Baldwin, H. J. (2/-)	25	25	4/9	—	10	10	6
Bakelite (10/-) ..	—	—	17/-	—		—	
British Aluminium	10	12	40/9	−6d	5	17	8
B.I. Callender's ..	7½	9	30/3	—	5	19	0
British Thermostat (5/-)	30	30	24/6	—	6	2	5
British Vac. Cleaner (5/-)	25	25	12/6	—	10	0	0
Brook Motors (10)-	20	20	28/9	—	6	19	2
Brush Ord. (5/-) ..	10	10	5/-	—	10	0	0
A. F. Bulgin (1/-) ..	27½	30	2/6	—	12	0	0
Burco (5/-) ..	42½	38¾	18/9	—	10	6	8
Chloride El. Storage	15	15	56/3	—	5	6	8
Cole, E. K. (5/-) ..	25	25*	15/-	—	8	6	8
Cossor, A. C. (5/-)	Nil	Nil	11/-	−3d		Nil	
Crabtree (10/-) ..	17½	17½	31/-	—	5	13	0
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	8/6	—	6	12	3
De La Rue (5/-) ..	50	35*	10/-	+6d	12	10	0*
Decca (1/-) ..	112½	112¼	15/6	−9d	7	5	2
Dewhurst (2/-) ..	35	22½*	4/3	−3d		—	
Dictograph Tel. (2/-)	20	20	4/6	—	8	17	9
E.M.I. (10/-) ..	8	12	13/9	−3d	8	14	6
Electrical Components (5/-) ..	20	20	10/-	—	10	0	0
Elec. Construction	15	15	43/6	—	6	18	0
Enfield Cable Ord.	7½	7½	21/-	+6d	7	2	10
English Electric ..	15	15	53/6	—	5	12	0
Ericsson Tel. (5/-)	22†	22*†	35/6	+6d	3	2	0†
Ever Ready (5/-) ..	35	35	23/-	—	7	12	2
Falk Stadelmann ..	15	15	35/9	—	8	7	10
G.E.C. Ord. ..	17½	22½	79/6	+1/-	5	13	3
General Cables (5/-)	30	30	12/6	—	12	0	0
Greenwood & Batley	15	15	28/3	−1/9	7	16	9
Hackbridge Cable (5/-)	20	20	10/3	+6d	9	15	2
Hackbridge Hewittic (5/-)	18	20	15/-	—	6	13	4
Hall Tel. Acc. (10/-)	10	10	10/-	—	10	0	0
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (5/-) ..	20	20	16/-	—	6	5	0
Holophane (5/-) ..	15	15	10/-	—		—	
Hoover (5/-) ..	37½	35*	23/3	—	7	10	6

Company	Dividend Previous	Dividend Last	Middle Price July 28 1952	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	20	25	21/6	—	5	16	3
Johnson & Phillips	15	15	49/6	—	6	1	3
Lancashire Dynamo	22½	12½*	38/6	—	6	9	1
Laurence, Scott (5/-)	12½	15	11/9	—	6	7	8
London Elec. Wire	10	12½	45/-	—	5	11	1
J. Lucas	17½	7½*	31/3	—	4	16	0
Marryat & S. (2/-)	22½	22½	5/-	—	9	0	0
Mather & Platt ..	12½	12½	41/3	+9d	6	1	1
Metal Industries ..	10	15	43/-	+6d	6	19	6
Mid. Elec. Mfg. ..	15	15	55/-	—	5	9	0
Murex	12½	15	53/9	+1/9	5	11	6
Newman Ind. (2/-)	6	10	2/6	—	8	0	0
Oldham & Son (1/-)	30	35	4/3	—	8	4	9
Parnall (Yate) (5/-)	6	6	3/-	−3d	10	0	0
Parsons, C. A. ..	15	10*	47/6	—	4	4	3
Plessey (5/-) ..	20	22½	17/-	—	6	12	4
Pye Deferred (5/-)	35	18*	16/-	—	5	12	6
Revo (10/-) ..	27½	27½	36/3	—	7	11	9
Reyrolle	15	10*	42/6	+6d	4	14	3
Scot. Cable (4/-) ..	30	32	20/9	—	6	3	6
Siemens Ord. ..	10	10	31/-	—	6	9	0
Strand Elec. (5/-) ..	17½	17½	8/3	—	10	12	2
Sturtevant (5/-) ..	16½†	17¼*†	21/3	—		—	
Switchgear & Cowans (5/-)	22½	22½	13/9	—	8	3	8
Taylor T. (5/-) ..	20	20	20/-	—	5	0	0
T.C.C. (10/-) ..	20	20*	36/3	—		—	
T.C. & M. ..	10	10	24/-	—		—	
Telephone Mfg. (5/-)	10	10	7/9	—	6	9	0
Thorn Elec. (5/-) ..	20	10*	8/6	—	5	17	8
Tube Investments	25	25	51/3	—		—	
Vactric (5/-) ..	Nil	Nil	4/6	—		Nil	
Veritys (5/-) ..	Nil	7½	4/3	+6d	8	16	6
Walsall Conduits (4/-)	70	70	49/6xd	—	5	13	3
Ward & Goldstone (5/-) ..	44	45*	37/6	—	6	0	0
Watford (2/-) ..	25	25	6/-	—	8	6	8
Westinghouse Brake	14	14	45/-	—	6	4	6
West, Allen (5/-) ..	12½	15	10/9	—	6	19	6
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord.	—	4½	77½	—	5	16	2
Ord.	—	56/3	50	—	5	12	6
Anglo-Portuguese	8	8	20/6	—	7	16	2
Brit. Elec. Traction: Def. Ord. ..	22½	25	400	—	6	5	0
Cable & Wireless: Ord.	6	8	111½	+1	7	3	6
4% Loan ..	4	4	96	—	4	3	4
Calcutta Trams ..	6†	6†	23/6	—	5	2	2†
Cape Elec. Trams	4	5	12/6	—	8	0	0
Marconi Marine ..	7½	10	28/-	—	7	2	10
Oriental Tel. Ord.	16	16	55/-	—		—	
Telephone Props.	8	8	27/6	—	5	16	0
Tele. Rentals (5/-)	10	10	7/9	—	6	9	0

* After capital bonus.
† Dividends are paid free of Income Tax.

UNITED STATES ELECTRICAL EXPORTS

Substantial Increase in 1951

AFTER a small decline between 1949 and 1950 United States exports of electric power plant recovered markedly last year, notably in the higher capacities. The figures in Tables I and II include exports under the various American foreign aid programmes. The total value of exports of electrical machinery and apparatus, exclusive of special category types, in 1951 was $551,877,000, an increase of about 40 per cent on 1950.

TABLE I.—ELECTRICAL MACHINERY

Class of Equipment	1951 $ (000)	Inc. or dec. on 1950 $ (000)
Generators, d.c.	3,486	+ 1,815
To Canada	2,914	+ 1,934
„ *Mexico*	42	— 51
„ *Venezuela*	72	+ 56
„ *Brazil*	100	+ 46
„ *Argentina*	51	+ 44
„ *France*	45	+ 17
„ *Ceylon*	29	+ 29
Generators, a.c.	5,983	+ 2,681
To Canada	519	+ 240
„ *Mexico*	286	— 139
„ *Colombia*	109	— 235
„ *Venezuela*	212	+ 85
„ *Brazil*	1,106	+ 872
„ *France*	464	+ 451
„ *Spain*	1,173	+ 1,173
„ *India*	602	+ 515
„ *Pakistan*	456	+ 444
„ *Australia*	222	+ 164
Steam turbo-generator sets, under 500 kW	671	+ 180
To Canada	170	+ 101
„ *Mexico*	45	— 9
„ *Venezuela*	51	+ 16
„ *Brazil*	140	+ 115
„ *Belgium*	45	+ 34
„ *Taiwan*	52	+ 52
Ditto, under 7,500 kW	2,736	— 1,754
To Mexico	172	+ 24
„ *Colombia*	271	— 333
„ *Brazil*	251	+ 93
„ *Argentina*	189	— 688
„ *Malta*	521	+ 521
„ *Taiwan*	206	+ 206
„ *Australia*	383	+ 383
Ditto, 7,500 kW and over	13,016	+ 7,530
To Argentina	1,607	+ 1,607
„ *France*	1,740	+ 1,740
„ *Italy*	5,316	+ 5,316
„ *India*	3,172	+ 3,172
Diesel-electric sets	19,926	+ 3,586
To Canada	2,280	+ 1,413
„ *Mexico*	2,104	+ 317
„ *Colombia*	1,170	+ 66
„ *Venezuela*	1,283	+ 393
„ *Brazil*	3,592	+ 1,479
„ *Argentina*	1,252	+ 977
„ *Turkey*	353	— 119
„ *Israel*	242	+ 73
„ *S. Arabia*	249	+ 141
„ *Pakistan*	405	+ 244
„ *Siam*	688	+ 586
„ *Indonesia*	480	— 400
Electric railway traction equipment and parts, railway motors inclusive	5,213	+ 2,283
To Canada	3,293	+ 2,197
„ *Brazil*	163	+ 15
„ *Holland*	347	— 224
„ *Belgium*	448	+ 443
„ *Algeria*	369	+ 311
Electric locomotives, mining and industrial	2,069	— 867
To Canada	906	+ 547
„ *Peru*	159	+ 15
„ *Austria*	137	— 100
„ *Italy*	153	+ 153
„ *Australia*	231	+ 175
Power transformers over 500 kVA	11,066	+ 1,803
To Mexico	556	— 1,350
„ *Venezuela*	270	— 372
„ *Peru*	161	+ 123
„ *Chile*	684	— 13
„ *Brazil*	989	— 1,213
„ *Iceland*	338	+ 338
„ *Denmark*	297	+ 162
„ *France*	2,672	+ 1,467
„ *Spain*	1,768	+ 1,730
„ *Turkey*	716	+ 484
„ *Israel*	527	+ 489
„ *India*	799	+ 713
Distribution transformers, 500 kVA and under	4,149	+ 484
To Canada	202	+ 91
„ *Mexico*	245	— 35
„ *Colombia*	332	+ 53
„ *Venezuela*	1,633	+ 1,016
Power switches, circuit breakers and parts over 10 A	11,990	+ 3,251
To Canada	4,769	+ 1,879
„ *Mexico*	1,473	+ 689
„ *Colombia*	215	— 45
„ *Venezuela*	382	+ 122
„ *Brazil*	1,160	+ 218
„ *France*	280	+ 167
„ *Yugoslavia*	469	+ 375
„ *Australia*	251	+ 141
„ *South Africa*	189	— 252
Motors, 1 to 200 h.p.	9,872	+ 1,985
To Canada	2,478	+ 1,041
„ *Mexico*	1,001	+ 407
„ *Colombia*	274	+ 17
„ *Venezuela*	666	+ 407
„ *Peru*	386	+ 233
„ *Chile*	340	+ 110
„ *Brazil*	566	+ 307
„ *France*	467	— 618
„ *Italy*	274	+ 149
„ *Greece*	111	+ 14
„ *Israel*	365	+ 113
„ *India*	203	+ 31
Motors over 200 h.p.	4,308	— 2,532
To Canada	510	+ 154
„ *Mexico*	206	+ 89
„ *Venezuela*	243	+ 123
„ *Chile*	308	+ 61
„ *Brazil*	432	+ 203
„ *Holland*	504	+ 447
„ *France*	842	— 1,874
„ *Italy*	308	+ 299
„ *Yugoslavia*	134	+ 107
„ *Israel*	114	+ 114

[*Continued on next page*

UNITED STATES ELECTRICAL EXPORTS (*Continued from preceding page*)

TABLE II.—ELECTRICAL GOODS AND APPARATUS

Class of Equipment	1951 $ (000)	Inc. or dec. on 1950 $ (000)
Portable electric metal working tools	3,444	+ 1,277
To Canada	1,363	+ 433
„ *Mexico*	229	+ 81
„ *Venezuela*	130	— 12
„ *Brazil*	530	+ 377
„ *Argentina*	166	+ 110
Household electric refrigerators and home freezers, 16 cu ft and under	60,640	+ 30,903
To Canada	13,296	+ 11,646
„ *Mexico*	1,627	+ 1,138
„ *Colombia*	2,348	+ 1,308
„ *Venezuela*	4,337	+ 730
„ *Brazil*	11,190	+ 7,524
„ *Belgium*	2,700	+ 199
„ *Switzerland*	1,143	+ 131
„ *Israel*	1,324	+ 229
„ *British Malaya*	991	+ 799
„ *Union of South Africa*	1,246	+ 1,232
Lamps, filament, small, miniature, etc.	5,286	+ 2,015
To Canada	481	+ 260
„ *Colombia*	170	— 4
„ *Venezuela*	154	— 1
„ *Chile*	117	+ 65
„ *Brazil*	723	+ 586
„ *Uruguay*	114	+ 80
„ *Argentina*	183	— 51
„ *India*	522	+ 401
„ *Siam*	176	+ 106
„ *Malaya*	320	+ 180
„ *Indonesia*	143	+ 106
„ *Hong Kong*	160	— 74
„ *Australia*	116	+ 34
„ *Union of South Africa*	185	+ 68
Lamps, filament, large	3,078	+ 392
To Canada	525	+ 209
„ *Mexico*	116	+ 43
„ *Colombia*	325	— 60
„ *Venezuela*	438	+ 119
„ *Peru*	114	+ 32
„ *Chile*	130	+ 16
Fluorescent bulbs and tubes	3,951	+ 350
To Canada	205	+ 121
„ *Venezuela*	141	+ 62
„ *Chile*	142	+ 110
„ *Brazil*	122	+ 120
„ *Argentina*	212	— 118
„ *Sweden*	100	— 1
„ *Belgium*	646	+ 224
„ *Germany*	129	+ 93
„ *Switzerland*	224	+ 55
Electric washing machines, household, semi- and fully automatic	5,007	+ 1,207
To Mexico	283	+ 169
„ *Colombia*	389	+ 160
„ *Venezuela*	715	— 294
„ *Peru*	115	+ 113
„ *Chile*	122	+ 69
„ *Brazil*	1,051	+ 955
„ *Belgium*	246	— 165
„ *Switzerland*	119	+ 113
„ *Italy*	248	+ 110
„ *Union of South Africa*	151	+ 147
Cooking ranges, household	1,922	+ 1,153
To Canada	550	+ 431
„ *Colombia*	234	+ 173
„ *Venezuela*	145	+ 62
Radio receiving sets, home type	7,849	— 100
To Mexico	792	+ 247
„ *Colombia*	424	— 434
„ *Venezuela*	1,364	— 76
„ *Peru*	216	+ 214
„ *Brazil*	476	+ 230
„ *Iran*	709	— 316
„ *Japan*	320	+ 285
„ *Egypt*	114	+ 5
Complete battery chargers, non-rotating	1,053	+ 344
To Canada	477	+ 216
„ *Brazil*	113	+ 54
„ *Indonesia*	23	+ 18

Sheffield Transport Finances

DURING the year ended 31st March last 163·9 million passengers were carried by the Sheffield Corporation Transport Department's trams, 5 million fewer than in the previous year. Income, however, rose from £1,384,592 to £1,518,385 as a result of a revision of fares towards the end of 1950, and there was a net profit of £12,609, against a deficit of £41,096 in 1950–51. Car miles run aggregated 12·5 million (12·8 million), 36·8 million kWh being used (38·8 million). Revenue averaged 29·26d per car mile (25·70d) and working expenses 26·07d (23·84d).

The Corporation's motor-buses earned £1,460,170 (£1,296,795) but on these services the year's operations resulted in a net loss of £66,789 (£53,946 deficit in 1950–51). On both trams and buses combined there was thus an adverse balance of £54,180, and after providing for renewals and a reserve towards the cost of reinstatement of roads following tramway abandonment the accumulated deficit carried forward is £260,547. On 9th March a further fares revision came into operation, but Mr. T. W. Bridgland, chairman of the Transport Committee, emphasizes that the additional fuel oil tax and other increased costs will necessitate "a close and constant watch" on the undertaking's finances.

At the end of March last the Department operated 435 trams (16 were placed in service during the year and 40 disposed of). Motor-buses, including those operated by the Joint Committee, numbered 553. The Fulwood–Malin Bridge tram services were withdrawn in January last, their place being taken by motor-buses. The general manager of the Transport Department is Mr. R. C. Moore.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 10th September from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1943

19667. Sperry Gyroscope Co., Inc.—High-frequency direction finding apparatus. 24th November, 1943. (678810.)

1946

20015. Philips Lamps, Ltd.—Filling vessels with gas. 4th July, 1946. (679111.)

1947

11460. Sperry Gyroscope Co., Inc.—Apparatus for varying the impedance between a source of high-frequency alternating current electrical energy and a load circuit. 30th May, 1947. (678713.)

23351. Marconi's Wireless Telegraph Co., Ltd.—Magnetron electron discharge devices. 22nd August, 1947. (678714.)

32167. Rost, H. F., Thunell, K. H., Vigren, S. D., and Claesson, P. H. E.—Radio apparatus for tracking an object in space. 5th December, 1947. (679112.)

1948

16081. Philips Electrical, Ltd.—Methods of and devices for manufacturing Fresnel surfaces. 15th June, 1948. (678916.)

1949

188. Westinghouse Electric International Co.—Formation of electrically insulating surfaces on ferrous metal laminations. 4th January, 1949. (678715.)

2036. British Thomson-Houston Co., Ltd.—High-potential coils. 25th January, 1949. (679117.)

11065. Radio-Industrie Soc. Anon.—Television receivers. 26th April, 1949. (678716.)

12449. Plessey Co., Ltd.—Method for forming printed circuits and printed circuit elements. 16th March, 1950. (678717.)

13425. Steatite & Porcelain Products, Ltd., and Clark, C. H. W.—Ceramic electrical devices and the manufacture thereof. 4th August, 1950. (678718.)

15941. Glasfloss Corporation.—Separators for storage batteries and method of making the same. 15th June, 1949. (678719.)

17547. Pye, Ltd., and Babbs, C. H.—Television apparatus. 30th June, 1950. (679123.)

17873. Philips Electrical, Ltd.—Cathode-ray tube circuits. 6th July, 1949. (679124.)

18920. Electric & Musical Industries, Ltd.—Frame scanning circuits for television and like apparatus. 12th July, 1950. (679125.)

19671. Wild-Barfield Electric Furnaces, Ltd., and Barfield, R. H.—Containers for heating by induction. 14th July, 1950. (679127.)

21224. Ingenjorsfirman H. F. Rost & Soner, and Blomqvist, S. G. F.—Resilient metal leaf springs for electric switching apparatus. 15th August, 1949. (678931.)

21587. Salisbury-Rowswell, P.—Storage batteries or accumulators. 18th September, 1950. (678721.)

21749. Philips Electrical, Ltd.—Travelling wave tubes. 27th September, 1949. (678723.)

25180. Westinghouse Electric International Co.—Treating of electrical windings with insulating varnishes. 30th September, 1949. (678936.)

27695. Westinghouse Electric International Co.—Frequency stabilizing systems. 28th October, 1949. (679130.)

29195. Westinghouse Electric International Co.—Electrostatic precipitators. 15th November, 1949. (679133.)

31339. Minister of Supply.—Electric-pulse code circuits. 22nd January, 1951. (678726.)

1950

59. Telefonaktiebolaget L. M. Ericsson.—Telephone apparatus of a type adapted to be fixed to a wall or the like. 2nd January, 1950. (679138.)

525. British Thomson-Houston Co., Ltd., Ball, E. H., and Stanworth, J. E.—Manufacture of high-voltage insulators. 27th March, 1951. (678811.)

2849. Philips Electrical Industries, Ltd.—Electric resistances. 3rd February, 1950. (679151.)

3226. Siemens Bros. & Co., Ltd.—Lamp jacks as used in telephone systems. 1st February, 1951. (679152.)

5604. Bowler & Sidney, Ltd., and Butterfield, T. L. H.—Electric-arc stud and like welding apparatus. 20th February, 1951. (678955.)

5632. British Communications Corporation, Ltd., and Heftman, T. S.—Radio repeaters. 6th June, 1951. (679154.)

5637. Negretti & Zambra, Ltd., and Forman, J.—D.c. and low-frequency a.c. amplifiers. 5th March, 1951. (679156.)

8019. Higgs, G. W.—Thermostatically controlled electric heating systems. 30th March, 1951. (678733.)

8146. General Electric Co., Ltd., and Aspin, J. J. E.—Discriminator circuits. 28th March, 1951. (678734.)

8457. Simon-Carves, Ltd., Symington, R., and Cleat, L. H.—Apparatus for effecting magnetically a separation between magnetizable and non-magnetizable particles contained in liquids or slurries. 29th March, 1951. (678737.)

9204. English Electric Co., Ltd.—Hydraulic turbines. 30th March, 1951. (678742.)

9242. General Electric Co., Ltd., and Stevenson, S. A.—Piezo-electric units. 13th April, 1951. (678825.)

9298. Automatic Telephone & Electric Co., Ltd.—Selector switches for use in automatic telephone systems. 3rd April, 1951. (678826.)

9373. Arvin Electric, Ltd.—Electric dry shavers. 17th April, 1951. (678831.)

9427. Ferranti, Ltd.—Electric fires. 17th April, 1951. (678833.)

9485. British Insulated Callender's Cables, Ltd.—Electric two-part cable couplings. 17th April, 1951. (679049.)

9499. General Electric Co., Ltd., and Irving, H. D.—Electric motor control systems. 18th April, 1951. (678835.)

9619. General Electric Co., Ltd., and Flint, F. C.—High-frequency electrical power measuring apparatus. 19th April, 1951. (678836.)

9623. British Insulated Callender's Cables, Ltd.—Electric cables. 18th April, 1951. (678837.)

10171. British Thomson-Houston Co., Ltd., Gimson, C. F., and Bourne, S. N.—Air break contactors or circuit breakers. 30th May, 1951. (678967.)

10717. British Dielectric Research, Ltd.—Electric capacitors. 30th April, 1951. (678753.)

10838. Glover & Co., Ltd., W. T.—Electric cables. 1st May, 1951. (678973.)

10915. Igranic Electric Co., Ltd., and Taylor, J. R.—Demagnetizing devices. 25th April, 1951. (678756.)

10954. Metropolitan-Vickers Electrical Co., Ltd.—Electric protective or monitoring systems for use in traction or haulage systems employing trolley wires. 13th April, 1951. (678757.)

11008. English Electric Co., Ltd.—Electrical insulation resistance-measuring apparatus. 4th May, 1951. (678975.)

11063. General Electric Co., Ltd., and Sowter, A. B.—Cold pressure welding. 2nd May, 1951. (678846.)

11081. National Research Development Corporation.—Electric batteries. 25th May, 1951. (678847.)

11140. Lucas, Ltd., J.—Thermally controlled electric switch. 20th April, 1951. (678760.)

11395. Reyrolle & Co., Ltd., A., and Hamilton, F. L.—Electric protective arrangements. 8th May, 1951. (678850.)

11712. Birmingham Small Arms Co., Ltd.—Centrifugally operated electric switches. 11th May, 1951. (679059.)

12241. Telegraph Construction & Maintenance Co., Ltd.—Manufacture of air spaced electric cables. 10th May, 1951. (679061.)

13200. Evershed & Vignoles, Ltd.—Devices for indicating and measuring the level of liquids. 25th May, 1951. (678863.)

13316. British Dielectric Research, Ltd.—Electrolytic capacitors. 25th May, 1951. (678865.)

13719. Pye, Ltd.—Electric relays. 23rd May, 1951. (678868.)

15743. British Thomson-Houston Co., Ltd., Gimson, C. F., and Powell, J. W.—Electro-magnetically operated air break contactors. 29th March, 1951. (679072.)

16266. General Electric Co., Ltd., and Pope, B. W.—Electrical systems of remote supervision. 26th April, 1951. (678770.)

17500. Marconi's Wireless Telegraph Co., Ltd.—Multiple unit d.c. power supply systems suitable for use for modulated radio transmitters and similar apparatus. 10th April, 1951. (678772.)

17821. General Electric Co., Ltd., and Chubb, A. A.—Means for converting varying electrical quantities into currents of varying frequency. 18th May, 1951. (678881.)

18551. Western Electric Co., Inc.—Negative impedance circuits and signal transmission lines loaded therewith. 25th July, 1950. (678993.)

19419. Jasper, C. H.—Insulating caps for joining electric current conductors. 3rd August, 1950. (678994.)

20213. Scholes & Co., Ltd., G. H., Pearce, G. S., and Pearce, F. J.—Fuse and like electrical connection boxes. 12th April, 1951. (678889.)

23008. Metropolitan-Vickers Electrical Co., Ltd.—Electric transformers and like apparatus. 3rd May, 1951. (678892.)

23412. Pritchett & Gold & E.P.S. Co., Ltd.—Electrical storage batteries. 29th June, 1951. (679149.)

26727. Western Electric Co., Inc.—Radio-frequency power amplifiers. 2nd November, 1950. (678777.)

31364. Wheelco Instruments Co.—Electric control circuit. 27th December, 1950. (678781.)

1951

6048. Akt.-Ges. Brown, Boveri & Cie.—Thermal power plant. 13th March, 1951. (679007.)

10297. British Thomson-Houston Co., Ltd.—Electrical devices for gas analysis. 2nd May, 1951. (678791.)

10491. Philips Electrical Industries, Ltd.—Tunable high-frequency push-pull power amplifiers. 4th May, 1951. (678795.)

10867. Standard Telephones & Cables, Ltd.—Electrical condensers. 9th May, 1951. (678802.)

11969. Felten & Guilleaume Carlswerk Akt.-Ges.—Aluminium covered electric cables. 22nd May, 1951. (678896.)

12162. Allmanna Svenska Elektriska Aktiebolag.—High-frequency induction tool. 24th May, 1951. (678898.)

12727. British Thomson-Houston Co., Ltd.—Light projectors. 30th May, 1951. (678906.)

12755. Zeiss Ikon Akt.-Ges.—Photo-electric exposure meters. 30th May, 1951. (678907.)

12810. Homann, W. (trading as Homannwerke W. Homann).—Rotary electric control switches. 31st May, 1951. (678909.)

12876. General Motors Corporation.—Storage batteries. 31st May, 1951. (679096.)

13755. Taylor, H.—Visual and audible electric alarm signals. 11th June, 1951. (679103.)

13984. Westinghouse Electric International Co.—X-ray systems. 13th June, 1951. (679104.)

14026. Compagnie Industrielle des Téléphones.—Telemetering system. 13th June, 1951. (679105.)

14150. Gibian, R.—Device for measuring the discharge voltage of primary or secondary cells. 14th June, 1951. (679106.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

16th August

ATLAS. No. 693,058. Class 7. Ironing machines, washing machines, wringing machines, combined washing and drying machines, machines for peeling and slicing vegetables, cream- and egg-whisking machines, mixing machines and hair drying machines, all being electrical goods. ATLAS. No. 690,427. Class 9. Flat irons, kettles, tea infusers, coffee percolators, pressure cookers and vacuum cleaners, all being electrical goods; and heating elements included in Class 9. ATLAS. No. 690,428. Class 11. Heating installations, heating apparatus included in Class 11, hair-drying apparatus (not being machines), toasting appliances and air-conditioning appliances, all being electrical goods.—Thorn Electrical Industries, Ltd., 105 to 109, Judd Street, London, W.C.1.

CASLODE. No. 705,038. Class 9. Wave guides incorporating ceramic material for use in wireless telegraphy. CASLODE. No. 705,039. Class 17. Electrical insulating material in the form of blocks and electrical insulating parts made therefrom.—Plessey Co., Ltd., 56, Vicarage Lane, Ilford, Essex.

SERVITEL. No. 707,290. Class 9. Radio, television and electronic apparatus and parts.—Servitel Television, Ltd., 72, King Street, Stretford, Manchester.

ROTAWIN. No. 707,681. Class 9. Radar apparatus.—Sucal, Ltd., 62–64, Temple Chambers, Temple Avenue, London, E.C.4.

23rd August

CONCATHENE. No. 707,578. Class 9. Aerials for wireless telephony, telegraphy and television; wire and cables, all for electric transmission systems; and electricity conductors.—Concordia Electric Wire & Cable Co., Ltd., Trent Mills, Derwent Street, Long Eaton, near Nottingham.

NOTEK (design). No. 704,482. Class 11. Electric torches, lamps for motor vehicles and parts included in Class 11 of such lamps; and vehicle reflectors and anti-dazzle devices for motor vehicle lamps.—Notek Electric Co., Ltd., 23, London Road, Bromley, Kent.

BOOKS RECOMMENDED BY

ELECTRICAL REVIEW

ADVANCED THEORY OF WAVEGUIDES
L. Lewin — 30s net. By post 30s 7d

RADIO DATA CHARTS
R. T. Beatty, M.A., B.E., D.Sc.
Revised by J. McG. Sowerby, B.A., M.I.E.E.
5th Edition. 7s 6d net. By post 7s 11d

RADIO LABORATORY HANDBOOK
M. G. Scroggie, B.Sc., M.I.E.E.
5th Edition. 15s net. By post 15s 5d

Obtainable at all booksellers or direct from:
The Publishing Dept., Dorset House, Stamford Street, London, S.E.1

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Durham.—8th August. County Council. Electrical installations in the High Usworth New County Primary School and the Peterlee New County Primary Infants' School. (See this issue.)

Formosa.—22nd August. Central Trust of China. Cables, petrol engine generator and switchboard set, runway lights, cut-outs, switches, etc. (C.R.E. 25267/52. Ten/4384.)*

Greece.—ATHENS.—21st August. State Procurement Service. Diesel engine (60 to 65 h.p.) and generator. (C.R.E. 26037/52. Ten/4392.)*

Kidsgrove.—11th August. U.D.C. Electrical installations in 128 houses and six bungalows, Lower Ash housing scheme. Architect, Town Hall.

London.—STEPNEY.—8th August. Borough Council. Lighting and power installation at 124 dwellings, Cornwall Street housing area. Borough engineer, 227-233, Commercial Road, E.1.

New Zealand.—WELLINGTON.—25th August. General Post Office. Telephone cables. (C.R.E. 25250/52. Ten/4365.)* 28th August Supply of cadmium copper wire. (C.R.E. 25464/52. Ten/4383.)*

26th August. Post and Telegraph Department. Insulating paper, tape, varnish and wire. (C.R.E. 2546/52. Ten/4374.)*

4th November. State Hydro-Electric Department. Switchgear for the New Plymouth substation. (C.R.E. 25407/52. Ten/4371.)* Air-break switches for Roxburgh power station. (C.R.E. 25406/52. Ten/4375.)*

AUCKLAND.—18th August. Auckland Electric Power Board. Supply of electric cable. (C.R.E. 25395/52. Ten/4382.)*

Peterborough.—City Council. Electrical installations in fifty houses. (See this issue.)

Portuguese East Africa.—LOURENCO MARQUES.—8th August. Ports, Railways, and Transport Administration. Motor generator sets and signalling lamps. (C.R.E. 24719/52. Ten/4360.)*

South Africa.—JOHANNESBURG.—6th August. South African Railways. Motors and starters. (C.R.E. 25221/52. Ten/4358.)* 28th August. Pinions and armature shafts for electric units and motor coaches. (C.R.E. 25070/52. Ten/4362.)*

Syria.—DAMASCUS.—6th September. Directorate General of Posts, Telegraphs and Telephones. Telephone and telegraph cable and equipment. (C.R.E. 25246/52. Ten/4386.)*

Uruguay.—MONTEVIDEO.—8th August. Administracion Nacional de Combustibles, Alcohol y Portland. Lamps. (C.R.E. 24740/52. Ten/4356.)*

27th August. Usinas Electricas y Telefonos del Estado. Accumulators for telephone equipment. (C.R.E. 25865/52. Ten/4388.)*

Washington (Durham).—18th August. U.D.C. Electrical work in 46 houses at Oxford Avenue. Surveyor, Council Chambers, Washington.

ORDERS PLACED

Bradford.—Corporation. Recommended. Conversion of 70 flats in the Longlands Property from gas to electricity (£718).—Shann & Bell, Ltd.

Eccles.—Housing Committee. Recommended. Electrical work in 90 houses and 12 flats, Ellesmere Park Estate (£2,877).—L. Knowles.

Morpeth.—Corporation. Electrical installations in 422 Council houses (£5,190).—Mood & Sons.

Peterborough.—Estates Committee. Recommended. Electrical installations in 170 houses on the Dogsthorpe North estate (£4,500).—M. F. Hansen.

Smethwick.—Corporation. Electrical wiring of the memorial stage at the Holly Lodge Grammar School (£142).—Felix Bateman, Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Adlington (Lancs).—Houses (38), Park Road site, for U.D.C.; W. E. Mayer, architect, 12, Cleveland Street, Chorley.

Altrincham (Ches).—Block of residential flats, St. Johns Road; L. D. Clegg Morgan & Co., architects, Oldham, Lancs.

Bowland.—Houses (60), on sites at Grindleton and West Bradford; R.D.C. surveyor, Grindleton, near Clitheroe.

Bridgend.—Houses (34), West House No. 1 housing site; D. J. Amos, surveyor, Council Offices, Glan-Ogwr, Bridgend.

Bridport.—Houses (24), Skilling site; Lambert & Oliver, 35, South Street.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Bungay.—Flats (36), Hillside Road area, for U.D.C.; Lancaster Builders, Ltd., Oak Street, Norwich.

Burton-on-Trent. — Houses (89), Ashby Road; Wilson Lovatt & Sons, Ltd., Clarence Street, Wolverhampton.

Cannock. — Completion of county mining college (£23,965); A. & R. Astbury, Bridgtown, Cannock.

Carlisle.—Nurses' recreation hall at Cumberland Infirmary for Hospital Board (£20,000); N. Edgar, architect, 1, Lonsdale Street.

Cheltenham.—County school on Arle estate; Gloucestershire county architect, Shire Hall, Gloucester.

Chesterfield. — Junior school, Newbold (£48,425); borough architect.

Corby.—Three-form entry grammar school (£198,790); county architect, County Hall, Northampton.

Daventry.—Houses (44) on various sites; R.D.C. architect, Daventry.

Doncaster. — Wheatley Modern Secondary School; borough architect.

Dorchester. — Houses (28), Middle Farm estate; borough architect, 21, North Square.

Dorking.—Houses (500), Goodwyns Farm site; U.D.C. surveyor, Council Offices, Pipbrook.

Droitwich.—Houses (18), Wychbold estate, for R.D.C.; Mackee & Rodway (Suburbia), Ltd., Northfield, Birmingham.

Easington.—Houses (54) at Thormley for the R.D.C.; Veti & Edwards, Ltd., builders, Sunderland.

East Grinstead.—Houses (60), Blackwell Farm estate; B. J. Cornelius, surveyor to U.D.C., East Court.

Enfield. — Enlargement of Enfield County School for Girls (£103,090); Middlesex county architect.

Essex.—Fire stations at Cold Norton, Dunmow, Newport and Thaxted (£25,080); H. Conolly, county architect, County Hall, Chelmsford.

Farnham.—Houses (60), Weydon Lane site; L. H. Starling, U.D.C. surveyor, South Street.

Filey (Yorks).—Houses (32), Muston estate, for U.D.C.; A. Schofield (Builders), Ltd., St. Bedes, Hornsea, Yorks.

Gateshead.—Child health centre, Carr Hill Road (£11,500); borough architect.

Hastings.—Houses (102) and five blocks of flats, Harley Shute estate, St. Leonards; borough surveyor, 37, Wellington Square.

Hayes.—Junior and infants' school at Minet estate, Hayes; Middlesex county architect.

Heanor.—Houses (40), off Upper Dunstead Road; surveyor, Council Offices, Heanor.

Hendon.—Houses (214), Edgware and Mill Hill; A. O. Knight, borough surveyor, Town Hall, N.W.4.

Flats (12), Holders Hill Circus; Richardson & Davis, quantity surveyors, 57, Queen Anne Street, W.1.

Luton.—Houses (234), Ramridge extension; director of housing, Town Hall.

March.—Bungalows (54), Badgeney Road; J. T. Cox & Sons, March.

Milford Haven.—Houses (60), Marble Hall estate for U.D.C.; Unity Structures, builders, 35, Tavistock Square, London, W.C.1.

Newbury.—Houses (102), Love Lane, Shaw estate; E. G. Hampshire, surveyor, Phœnix House.

Newcastle-on-Tyne.—Flats (78) in Armstrong Road; city architect, 18, Cloth Market, Newcastle.

Northallerton.—Houses (54), Valley Road, for the U.D.C.; Moody Brothers, builders, East Road, Northallerton.

Paisley.—Houses (168), on sites at Blackhall and Hunterhill; J. A. McGregor, burgh surveyor, 14, Gilmour Street.

Portsmouth.—Flats (47), Somers Road and Hyde Park Road; A. G. Goodair, architect, Albemarle House, Osborne Road, Southsea.

Potters Bar.—Dwellings (80), Oakmare estate; U.D.C. surveyor.

Stamford.—Houses (52); Morton Potter, Ltd., Leicester.

Sunderland.—Houses (387); borough architect, Stockton Road.

Sutton Coldfield. — Houses (42), Orton Avenue, Walmsley; J. A. Hill, 20, Cromwell Street, Birmingham, 7.

Tottenham.—Public library, 16 maisonnettes and three old persons' flats, High Road/Brereton Road site; borough surveyor, Town Hall, N.15.

Towcester.—Extensions to county modern school (£20,124); county architect, County Hall, Northampton.

Uffculme (Cullompton). — Modern school (£93,500); Devon county architect, 97, Heavitree Road, Exeter.

Uxbridge.—Canteen (£10,000) for Uxbridge Flint Brick Co., Ltd.; F. Scarlett, architect, 18, Mansfield Street, W.1.

Wakefield.—Houses (100), on sites at Crofton and Sharlston; R.D.C. surveyor, Council Offices, St. John's North.

Wallsend. — Houses (144) for the T.C. Builders: J. H. James, Archer Street, Wallsend (88) and J. Armstrong, Meadowfield Road, Gosforth (56).

Methodist church at Low Willington Farm for Rev. W. Jacques, 23, Grosvenor Place, North Shields.

West Ham.—Dwellings (91), Romford Road and Whitwell Road area; borough architect and planning officer.

Whickham (Co. Durham).—Houses (94), Swalwell Bank, for U.D.C.; Fennell & Co., architects, Bridge End Chambers, Chester-le-Street, Co. Durham.

Whitley Bay.—Flats, Seatonville neighbourhood unit, for U.D.C.; E. Roberts, surveyor

Widnes.—Houses (36), Ditton neighbourhood unit; borough architect, Brendan House, Widnes Road.

Windsor.—Houses (50), Clewer Hill Road, Manor Farm; borough surveyor, Kipling Memorial Building.